SONS OF MARTHA

University of Alberta Faculty of Engineering 1913-1988

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I would like to dedicate this history of the Faculty of Engineering to the memory of Professor I.F. Morrison and Professor R.M. Hardy, who were my teachers, my colleagues, and friends.

George Ford

Contents

The Ritual of the Calling of an Engineer

At the annual meeting of the Engineering Institute of Canada held in Montreal on January 25, 1922, the luncheon speaker was Professor H.E.T. Haultain, of the University of Toronto. In his address entitled "The Romance of Engineering", he urged the development of a tribal spirit among engineers. Professor Haultain was invited to enlarge upon his idea at the retiring president's dinner that evening. He suggested an oath or a creed to which the young graduates in engineering could subscribe. Seven past presidents of the Institute were present and at Professor Haultain's suggestion, these seven men were constituted a committee to act on this proposal. Past president J.M.R. Fairbairn, chief engineer of the Canadian Pacific Railway, was appointed chairman.

Professor Haultain wrote to Rudyard Kipling on October 18, 1923, with the blessing of the committee, and outlined the discussion held at the retiring president's dinner and sought his help. Kipling replied on November 9, sending Haultain The Ritual of the Calling of an Engineer, along with notes now part of the Ritual. Kipling included the poem "The Sons of Martha".

The inaugural ceremony was held in Montreal on the evening of April 25, 1925, when six members were inducted. Camp I was established at the University of Toronto on May 1, 1925. Other camps were established across Canada. The inaugural ceremony of Camp VI of the Ritual of the Calling of an Engineer was held in Edmonton on April 21, 1930. Thirty practicing engineers were obligated.

Dudley Menzies, president of the ESS, was spokesman for the first graduating class at the University to become obligated in 1931. To date, eleven thousand five hundred candidates, students about to graduate and practicing engineers who desire to be obligated, have been inducted at Camp VI.

The Sons of Martha

"The Sons of Mary seldom bother, for they have
inherited that good part;
But the Sons of Martha favor their Mother of
the careful soul and the troubled heart,
And because she lost her temper once and because
she was rude to the Lord, her Guest,
Her Sons must wait upon Mary's Sons, world
without end, reprieve, or rest.

It is their care in all the ages to take the
buffet and cushion the shock.
It is their care that the gear engages, it is
their care that the switches lock,
It is their care that the wheels run truly; it is
their care to embark and entrain,
Tally, transport, and deliver duly the Sons of
Mary by land and main.

They say to mountains, 'Be Ye Removed'. They say
to the lesser floods, 'Be dry'.
Under their rods are the rocks reproved. They
are not afraid of that which is high.
Then do the hill tops shake to the summit. Then
is the bed of the deep laid bare,
That the Sons of Mary may overcome it, pleasantly
sleeping and unaware.

They finger death at their gloves and where they
piece and re-piece the living wire,
He rears against the gates they tend; they
feed him hungry behind their fires.
Early at dawn, ere men see clear, they stumble
into his terrible stall.
And haul him forth like a haltered steer, and
goad and turn him till evenfall.

To these from birth is belief forbidden; from
these till death is relief afar.
They are concerned with matters hidden - under
the earth line their altars are,
The secret fountains to follow up, waters
withdrawn to restore to the mouth.
And gather the floods, as in a cup, and pour them
again at a city's drouth.

They do not preach that their God will rouse them
a little before the nuts work loose,
They do not teach that His pity allows them to
leave their job when they damn-well choose,
As in the thronged and lighted ways, so in the
dark and the desert they stand,
Wary and watchful all their days that their
brethren's days may be long in the land.

Raise ye the stone or cleave the wood to make a
path more fair or flat;
Lo, it is black already with blood some Son of
Martha spilled for that;
Not as a ladder from earth to heaven, not as a
witness to any creed,
But simple service simply given to his own kind
in their common need.

And the Sons of Mary smile and are blessed - they
know the angels are on their side.
They know in them is the Grace confessed, and
for them are the Mercies multiplied.
They sit at the Feet - they hear the Word. They
see how truly the Promise runs.
They have cast their burden upon the Lord, and —
the Lord he lays it on Martha's Sons!"

Rudyard Kipling

Chapter 1
A Look At Our Past

Alberta became a province in 1905. An act establishing the University of Alberta was passed in 1906 but it was not established in a tranquil environment. R.B. Bennett and his Conservative friends tried in vain to have the capital set in Calgary. When Edmonton was chosen as the capital, Calgarians demanded that the University be sited in their city. Premier Rutherford, that wily Liberal provincial leader, persuaded the assembly to construct the University on neutral ground in his riding of Strathcona. Mr. Bennett was incensed and in one of his speeches in the Alberta Legislature he was heard to rant, "The day will come when outraged citizens of Alberta will tear down the University and cast it, brick by brick, into the North Saskatchewan River."

Later, when a Faculty of Agriculture was to be added to the University in Edmonton, the opposition from Calgarians was vociferous. President Tory had to travel to Calgary:

> so strenuous was the debate Tory had to face at a public meeting in Calgary to get the faculty of agriculture established at Edmonton rather than at a southern point, he told me he felt afterwards as though he had been beaten all over with clubs, and had to spend two days in bed recovering from nervous exhaustion.[1]

The University of Alberta was created by an act of the legislature of the province passed at the first session after provincial autonomy had been granted; that is, the act created the machinery by which the University could be brought into existence. By the University Act, the Chancellor, the Vice-Chancellor, the Senate and the Convocation (the University), are empowered to undertake the organization and development of the teaching facilities, to affiliate colleges, and generally to undertake the work related to an institution of higher learning.

An amendment to the University Act was passed during the sessions of the legislature in 1907. The amendment authorized the Lieutenant-Governor-in-Council, as a preliminary step in the organization of the University, to appoint the president. The President would be given the responsibility, in conjunction with the Senate, of organizing and developing the University of Alberta. Acting upon this authority, the government selected the first president. Dr. H.M. Tory entered upon his duties on January 1, 1908.

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[1] R. Newton. I passed this way - (Memoirs)

The University Act states that all resident graduates of British and Canadian universities became members of the Convocation of the University of Alberta by registering before a fixed date. Three hundred and sixty-four graduates representing all the Canadian and many of the British universities, registered so that a large and representative body constituted the Convocation. The Senate became the governing body in relation to education and business management. It consisted of fifteen members: the Convocation elected five members, the remaining ten were appointed by the provincial government. The Chancellor was elected by the University Convocation. Voting for election to the Senate closed March 18, 1908. The ten members from government were appointed immediately.

Left to right: "Turning the sod," A.C. Rutherford driving, W.D. Ferris at the plough, and J.A. McDougall.

Henry Marshall Tory, President of the University of Alberta and Chairman of the Faculty Council of Engineering.

A.C. Rutherford, Chancellor, 1927-1941.

The University was located in the city of Strathcona, across the North Saskatchewan River from Edmonton, and opposite the proposed legislative buildings. It consisted of 258 acres of land, obtained at a cost of $150,000 . . . the elevation above the river is about two hundred feet, while the frontage on the river, at that time, was 2,100 feet. It was described as one of the most beautiful sites in Canada, "a beautiful wooded park which lends itself splendidly to an architectural scheme suitable for University purposes."[2]

The first meeting of the Senate was held on Monday, March 30, 1908. It resolved to undertake the organization of the Faculty of Arts and Science and to open the Faculty for classes in September.

Provision was made for three classes of instructors at the University, the salaries being fixed as follows:

1 Professors $2,500 per annum, increasing to $3,000 in five years, engagements to be for five years,
2 Assistant Professors $1,800 per annum, increasing to $2,250 in five years, engagements to be for five years,
3 Lecturers $1,200 per annum, appointments for one year only.

Four professors were appointed at the second meeting of the Senate on July 6, 1908. They constituted, with the president, the first faculty of the University:

[2] The first Annual Calendar of the University

- William Hardy Alexander, M.A.(Toronto) Ph.D.(California)
  Professor of Classics
- Edmund Kemper Broadus, M.A. (Chicago) Ph.D. (Harvard)
  Professor of English
- Luther Herbert Alexander, M.A. (Toronto)
  Professor of Modern Languages
- William Muir Edwards, M.Sc. (McGill)
  Assistant Professor of Mathematics, Lecturer in Civil and Municipal Engineering.

The University session was divided into two terms. There were two weeks holidays at Christmas in the first term and five days at Easter in the second term. The first term began September 23rd and closed February 1st, the second term began February 2nd and closed June 1st. The work of each term was completed at the end of that term. A student compelled to be absent during the second term of any year could join the classes in the second term of any subsequent year. Undergraduate courses leading to degrees extended over four sessions of two terms each. Courses were offered in the Faculty of Arts and Science leading to the degrees of B.A. and B.Sc. in Arts and the degree of B.Sc. in Applied Science.

Courses offered in the first sessions were chosen to meet the needs of the province and emphasized subjects which were of greatest practical interest, namely those required by students preparing to teach in high schools and the various practical sciences. To carry out this mandate traditional departments, together with a Department of Applied Science, were organized. The latter department taught mathematics, mechanics, surveying, chemistry, practical chemistry, descriptive geometry, drawing, physics and practical physics. Then, as now, the engineering program leaned heavily toward the basic sciences.

The University opened for classes on September 23, 1908, in the Duggan Street School, Strathcona. Later it moved to the new Collegiate Institute (now known as Old Scona) where classes were held in 1909-1910. It was here that the first graduation exercises were held on May 16, 1911. Forty-five students registered for full or partial courses during the year. The report to the Lieutenant-Governor-in-Council notes, "No University in the history of Canada began its career with so large a number of students or under more favorable circumstances." These circumstances, despite the unfavorable economics of today, prevail.

The formal opening of the University took place on October 13, 1908, when the first convocation was held. *Ad Eundem* degrees were conferred on the members of Convocation, all of whom were given the standing they already held. Honorary degrees were conferred on Lieutenant-Governor G.H.V. Bulyea, Premier A.C. Rutherford and the Chief Justice of the Province, Mr. Justice A.L. Sifton.

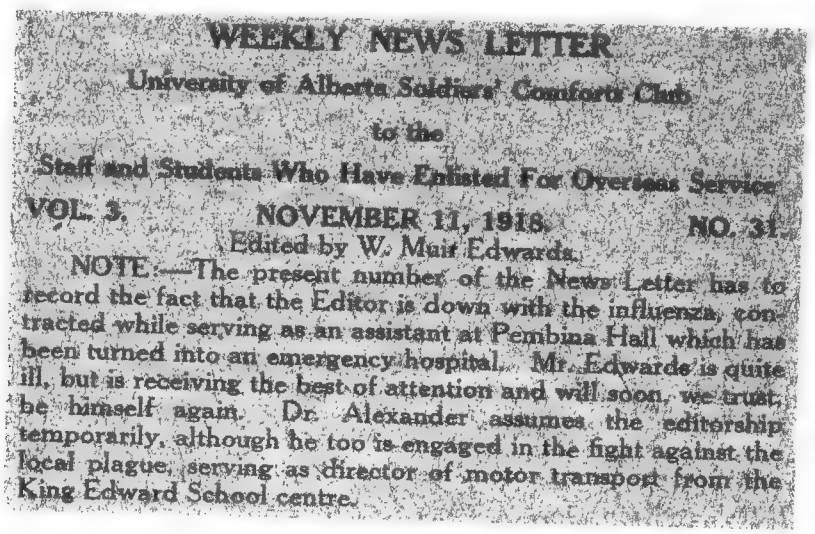
The following year, 1909, five additional appointments in the humanities were made. The Department of Civil and Municipal Engineering was created and W. Muir Edwards was promoted to the position of professor of that department.

William Muir Edwards (B.A.Sc., M.Sc., C.E., D.L.S., A.L.S.) was born in Ottawa on November 14, 1871, and was educated at Ottawa Collegiate and McGill University. He graduated from McGill at the head of his class in applied science in 1901, winning the British Association Medal for Applied Science. The following year, he graduated in civil engineering, winning the British Association Medal. He remained at McGill as a lecturer in mathematics and civil engineering. He was appointed Assistant Professor in 1907.

In 1908, President Tory chose Edwards as one of the four original appointments to the University of Alberta. During his tenure at the University, he practiced his profession as well as taught. He is credited with eliminating the cause of a serious typhoid epidemic in Edmonton by redesigning the water intake. In 1913, Edwards obtained his commission as a Dominion Land Surveyor and shortly afterwards as an Alberta Land Surveyor. Until his untimely death, he maintained a keen interest in the associations.

W.M. Edwards

While Edwards did valuable work organizing his department, his record as administrator does not appear to have been successful. Letters from President Tory to Premier Rutherford question Edwards' ability in this area. Recollections of a number of the early staff members bear this out. Had Edwards continued to head the Department, many staff members would have resigned. Muir Edwards was an avid sports enthusiast. He played on the rugby team and won the McGill Athletic Association silver medal, breaking the record in the two-mile race. He continued his interest in athletics, becoming president of the A.A.A.U.



WEEKLY NEWS LETTER

University of Alberta Soldiers' Comforts Club

to the

Staff and Students Who Have Enlisted For Overseas Service

VOL. 3. NOVEMBER 11, 1918. NO. 31.

Edited by W. Muir Edwards.

NOTE:—The present number of the News Letter has to record the fact that the Editor is down with the influenza, contracted while serving as an assistant at Pembina Hall which has been turned into an emergency hospital. Mr. Edwards is quite ill, but is receiving the best of attention and will soon, we trust, be himself again. Dr. Alexander assumes the editorship temporarily, although he too is engaged in the fight against the local plague, serving as director of motor transport from the King Edward School centre.

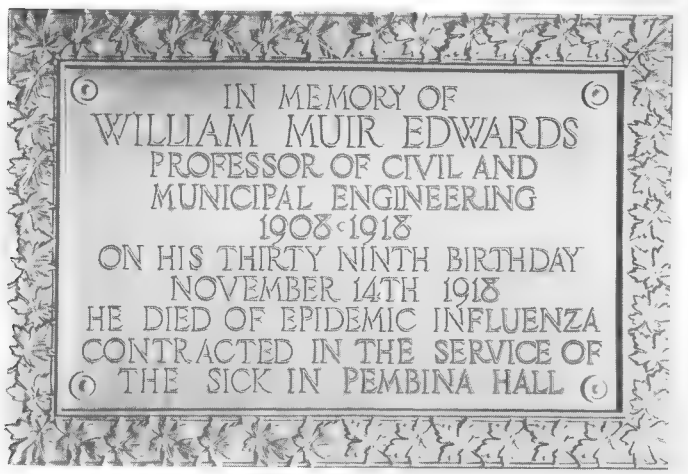
Edwards maintained a close relationship with the student body. At the outbreak of World War I, he craved to join his students in active service, but circumstances denied him that opportunity. Edwards founded the Weekly Newsletter, sent to staff and students who had enlisted for overseas service.

Dr. Alexander, in his memoriam to Muir Edwards said:

> This newsletter, which he conceived and ably edited so long, will constitute in your graceful recollections his most perfect remembrance. Some knew him in the classroom of the Applied Science Faculty, others learned his quality in the football field or the boxing ring, but all alike, including many to whom he was otherwise a stranger, learned to look on him as the one who thought of them in their toils and travels afar, patiently week by week, to give them news of home and comrades, not merely to give them lip service upon occasion.

When Pembina Hall was made an emergency hospital in the epidemic which lies so heavily on the City of Edmonton, Professor Edwards volunteered to serve there in any capacity, and I have learned how in those first awful days before order emerged under his hand from chaos, he tenderly bore the sick in and reverently carried the dead out, and by ready acceptance of the meanest tasks inspired in others a true sense of service. Though he could not be with you over there, he has not broken faith either with you who still survive the battle's chance or those others who sleep where on shell-torn plains the poppy blooms the red of heart's blood.

On November 14, 1918, Professor W. Muir Edwards died from influenza, the dreaded disease he had so tirelessly fought. He was survived by his wife, who was a towering suffragette, a son, and two daughters.



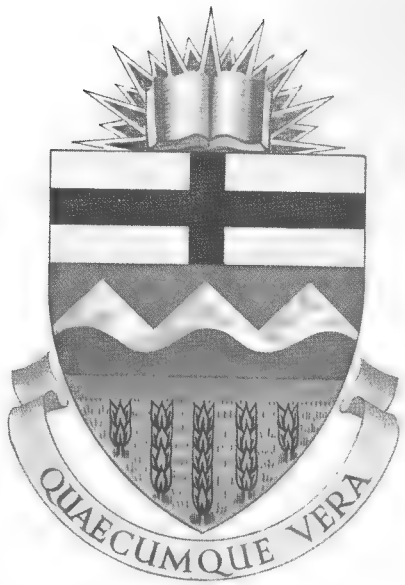
The third annual report of the University dated June 30, 1911, noted the addition of four new staff members to the Faculty of Arts and Science. Two appointees, James Adam and Dr. E.W. Sheldon, served the University and in particular the Faculty of Applied Science (Engineering) with dedication and distinction until their retirement.

J. Adam

James Adam (Jimmy, as he was known to all the engineering students who came under his quiet, kindly tutelage), was a native of Paisley, Scotland. He studied at Glasgow and London Universities. Before leaving his homeland for Canada, in 1908, he was headmaster of a school with an enrolment of 1400.

Shortly after his arrival in Alberta, Adam enrolled at the University and in 1911, while still an undergraduate student, he was appointed Instructor in Drawing, a post he held until his retirement, in 1938.

Jimmy Adam was an excellent student, graduating *summa cum laude* with a Bachelor of Arts degree, majoring in English and philosophy. He was awarded the Alexander Cameron Rutherford Gold Medal in English. In 1915, he received his Master of Arts. During his undergraduate years, he designed the first University of Alberta crest, approved by the Board of Governors, March 1, 1911.



The Arms of the University of Alberta. Original design by J. Adam, approved by the Board of Governors March 1, 1911.

Revised design by H.G. Glyde, approved by the Board of Governors March 21, 1950. 75th Anniversary.

Current University emblem designed by Professor W. Jungkind, adopted in 1984.

Dr. Robert Newton, President of the University, paid the following tribute on Adam's retirement:

> During 27 years service on the staff of the University of Alberta, Professor James Adam made a distinct contribution to the life of the University and community. Not only was he an excellent teacher of drawing, his professional subject, but he was a man of broad literary and artistic culture, with a great influence on the lives and thoughts of the student body and of his friends and colleagues.

His Edmonton friends recalled that Professor Adam held a life membership in the Edmonton Museum of Arts, given in recognition of his services to the museum. He had been President of the University Philosophical Society twice and took a keen interest in the Alberta Music Festival.

His students long remembered his classical approach to descriptive geometry. Like Leonardo da Vinci, who was the last of the great empirical engineers, Jimmy Adam was the last instructor to use the classical graphical method in the solution of engineering problems. Modern descriptive geometry, as taught by his successor, Professor W.W. Preston, was a quantum leap in the solution of engineering problems by graphical means.

Dr. E.W. Sheldon joined the staff of the University with the second group of appointees as an Assistant Professor of Mathematics. He served on the Faculty Council of Applied Science/Engineering from its inception, and ably demonstrated his loyalty to engineering. Sheldon was an honors graduate and a Gold Medalist of McGill. He spent four years at Yale University. After a distinguished career as a student and a teacher, he took his Ph.D. degree.

During his career on the University staff, Sheldon maintained a keen interest in the welfare of the students and served continuously on the First Year Promotions Committee. This position brought him in contact with all first year students.

E.W. Sheldon

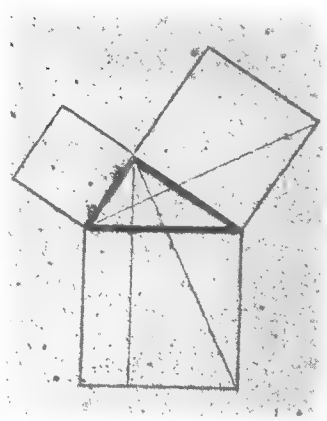
Sheldon taught mathematics to most of the science and engineering students who attended the University between 1910 and 1947, his retirement year.

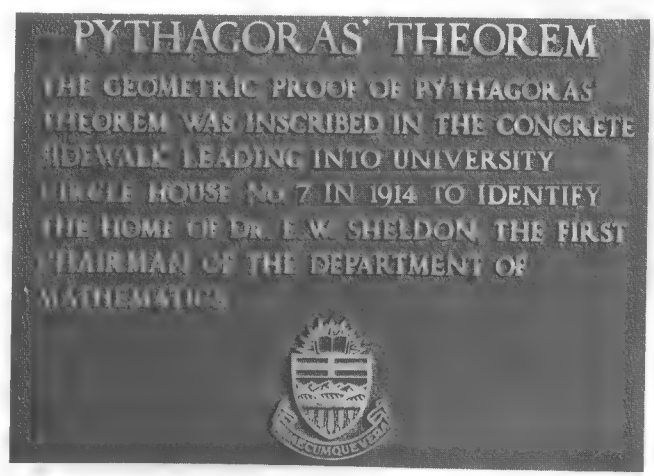
Students who came into contact with his dynamic personality will remember being confounded by his histrionics on the stage of Convocation Hall and of his chasing infinity across the stage and finally out of the window. The students feared for his life because they were sure he was about to fly off into space, and for his sanity because of the many strange but unforgettable demonstrations that were designed to instill some obscure point or important principle in their minds.

The demonstrations continued year after year and often had hilarious moments. A student who was repeating the course waited for the moment he knew was coming and, when infinity went flying through the window with Sheldon in hot pursuit, stood up, took aim, and yelled "BANG, I got it!!" Dr. Sheldon was shocked out of his shoes but did not lose his great sense of humor that afternoon. "Son", he said, "no one can shoot down infinity."

Sheldon's 39 years at the University were filled with service to the institution and the students he loved. He will be remembered as a dynamic and unorthodox teacher who sought to instill two things: to think for oneself and to develop a sense of continual curiosity. Not all of his students, it must be admitted, were sympathetic with his aims or with his antics while making fundamental points. But for those who were, he left treasures of the mind, the best a university has to offer.

After retirement, Sheldon continued to teach at the University for two years. He then departed for Acadia University in Nova Scotia to resume full-time duties as Interim Professor and Head of the Department of Mathematics. E.W. Sheldon died in Edmonton, June 15, 1950. His home on campus was marked by the geometric proof of the Pythagorean theorem etched in the concrete sidewalk leading to the front door. That section of sidewalk can be found today in the walkway leading into the Mechanical Engineering building. It provides a reminder of the dedicated work of an early pioneer.





Pythagoras' theorem was inscribed on the walk leading to E.W. Sheldon's home, University Circle Number 7. When Sheldon's residence was demolished to make way for university expansion, the concrete block was picked out of the rubble and stored with the works department. It was installed in the front walk of the Mechanical Engineering Building, when it was completed, in 1972. Dr. Peter Meekison, Vice-President (Academic) arranged for the descriptive plaque.

Nineteen hundred and twelve was a gala year for the Faculty. The University celebrated the beginning of term with the opening of Athabasca Hall, the first of a group of three University residences. In addition to being a residence for 50 students, the building supplied seven classrooms, five laboratories including an assay

Campus, 1919.

laboratory and a testing laboratory, offices, a library, a reading room, a dining-room, and a kitchen. The University suffered from what was to become a chronic disease lasting to this day, overcrowded classrooms.

Eleven new appointments were made, four of whom had a profound influence on shaping the destiny of engineering education in the province. They were R.W. Boyle, Professor of Physics; J.A. Allan, Lecturer in Geology; I.F. Morrison, Lecturer in Civil Engineering; and C.A. Robb, Lecturer in Mechanical Engineering.

Robert William (Billy) Boyle was born in Newfoundland on April 18, 1883. When Boyle graduated from high school he was awarded the Newfoundland Jubilee Scholarship. This enabled him to enter McGill where he had a brilliant academic record. When he graduated in electrical engineering he was awarded the Scott

R.W. Boyle, First Dean of Engineering.

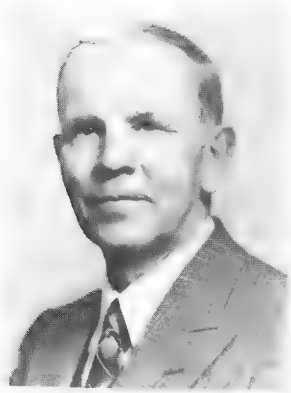
Prize, the General Electric Scholarship, the British Association Prize and the British Association Medal.

After graduation in 1905, he was appointed a demonstrator in physics under Lord Rutherford. He received the first Ph.D. in Physics granted at McGill for his investigations into the properties of the emanations of radium and thorium. The year was 1909. Boyle was chosen as an 1851 Exhibition Scholar that year. He studied under Sir J.J. Thomson[3] at Cambridge and with Lord Rutherford[4], at Manchester.

Boyle taught physics and mathematics when he returned to McGill in 1911. In 1912 President Tory, a physicist, persuaded him to become Head of the Department of Physics at the new provincial University. Boyle established an excellent department, noted for the quality of instruction and for the emphasis on research. While Head of the Department of Physics, his drive and enthusiasm enabled him to establish and direct the Department of Electrical Engineering.

Lack of students caused a lull on campus during World War I. Boyle joined the Anti-Submarine Division of the Admiralty and pioneered research on "asdics" which detected submarines almost a mile away. His work was perfected and used during World War II. Boyle returned to the University of Alberta in 1919 and, with a small band of enthusiastic graduate students, continued his research on ultrasonics. He was appointed Dean of the Faculty of Applied Science in 1921. This appointment gave Boyle the opportunity to influence research in diverse fields. He established the foundation for original investigation in scientific work at the University. Boyle shaped the research capabilities of the Faculty to benefit the province and the country and the surge in research that started with Boyle has continued.

Dr. Tory, now President of the National Research Council, contacted Boyle who was in Europe during the summer of 1928. He offered to pay Boyle's expenses to examine research establishments in England, Germany and France. Boyle's reports made a significant contribution to the design of the laboratory arrangements at the Council. Tory had an uncanny ability to spot brilliant people and, with great persuasion, win them over to his cause. In September 1928, Dr. Tory appointed Boyle to become the first Director of Physics and Electrical Engineering at the National Research Council. He held this position until his retirement in 1948.



J.A. Allan

The second appointment, that of Dr. John A. Allan, had an even greater impact on the emerging engineering faculty. Dr. Allan, known to generations of students as "Hardrock" Allan, was born in Aubrey, Quebec, which lies on the southwest side of the Chateauguay Valley, in the post-glacial marine basin. The family farm was located near the Champlain fault. The structural features of his surroundings directed Allan's interest to the study of geology. Allan graduated in geology from McGill in 1907, and in the following year he obtained his M.Sc. He was awarded a fellowship at the Massachusetts Institute of Technology where he obtained his Ph.D. in 1912. The same year, he received an appointment at the University of Alberta as a lecturer in the Department of Geology. He was made Professor and Head of the Department in 1913. He held this position until he retired, in 1949. Allan began a geological collection (museum), and carted rocks from every area of Alberta to the upper floor of the Arts building. The museum, which remained under his direction, grew and included a representative collection of native artifacts.

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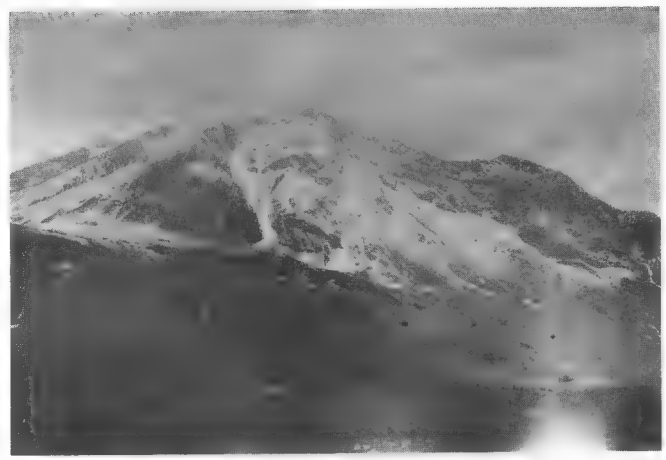
[3] Henry Marshall Tory - Chapter 9

[4] Ibid.



Left to right: Geology Museum Rock Collection (1935)

Turtle Mountain from the road through the slide.

Allan was a tartar, a stickler for detail and exactness. He explained the difference between eskers, kames, and drumlins, but they remained just piles of sand and gravel to the engineers. His wrath would descend on the student who referred to the Turtle Mountain Slide as the Frank Slide. He thoroughly delighted telling students that engineers, to their regret, never, never listened to the sage advice of the geologist! Witness the St. Francis Dam failure, or the cracks in the Arts building caused by setting the building partly on an esker and partly on a kame. The truth of the matter surfaced a year or two later when Professor Morrison explained that the St. Francis Dam failed because of a geological oversight and that Dr. Allan overloaded the upper floor of the Arts building by carting up heavy rocks.

In those days the student had to know for whom he was writing an examination! Let it be said that the classes were taught by senior, experienced professors who instilled a love of learning laced, sometimes, with misconceptions and perhaps even untruths . . . "no oil in the Devonian shales . . . man could never reach the moon . . . no man could ever fly faster than the speed of sound."

Starting in his undergraduate days in 1906, and continuously until 1918, Allan was connected with the Geological Survey of Canada on field work in various parts of British Columbia and the area from Golden to the mountains east of Banff. In Alberta, Allan carried out surveys at Lesser Slave Lake, along the North Saskatchewan, the Red Deer and the South Saskatchewan River as far east as the Saskatchewan border.

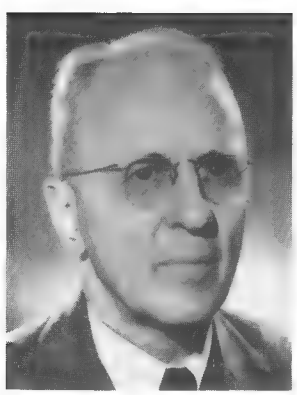
Allan was convinced that Alberta's economy would be greatly enhanced through the development of its natural resources. In 1919, he began a systematic investigation of the mineral resources of Alberta. In the course of this assignment, he helped to organize what is now the Alberta Research Council. He served as Head of the Geological Section of the Council for many years and in that capacity published a yearly report on some aspect of geological importance. His reports are a monument to his ability as a field geologist. His interest was devoted to coal, which in those days was King, and supported many small, dirty hamlets in Alberta with a low standard of living but a high quality of life. The geological studies directed by Allan and supplemented by the field work he organized made a major contribution to the development of Alberta oil, gas and coal resources. This legacy of achievement enabled his students to discover the vast oil fields of Alberta.

Allan wanted the field of geology to be formally recognized as a profession. In 1920, an act establishing the Association of Professional Engineers was proclaimed. Allan joined the Association and immediately arranged to have geology recognized as a separate section. He was an active member of the council of the Association and became its eleventh president in 1930. It is unfortunate that he did not live to see the title of the act changed to incorporate geologists and geophysicists.

Allan was engaged as a consultant, by Calgary Power (now TransAlta Utilities), to work out the geological details in connection with the Spray River power project and later with the Ghost River project. The Ghost River Dam across the Bow River was completed in 1929. It stands as a monument to Dr. Allan and his close friend and colleague, Professor I.F. Morrison of the Department of Civil Engineering.

Dr. Allan's service to his profession and to the province was outstanding; his teaching and his rapport with his students was exceptional. Students in geology lived with him for four years, but most engineering students came into contact with him in second year. His lectures stayed with them throughout their careers. Through references to his experience, Allan showed how closely some fields of engineering and geology overlapped.

Throughout his career at the University, Dr. Allan was a friend and colleague of the engineering faculty. He sat on their Faculty Council for many years, and in 1914 when the mining engineering department opened, he acted as Head. For those fortunate enough to have studied under him, he will always be remembered for his high standard of excellence. In turn, he demanded excellence of those about him. It is no wonder that he was lovingly referred to as "Hardrock." Today his name has become a household word in Alberta. In recognition of his services to the geological survey of Alberta, a mountain in the Kananaskis country was named after him. He must have gleefully watched from on high as the Olympic Committee struggled to get snow on it for the 1988 Winter Games.



I.F. Morrison

In 1912, two appointments were made at the junior level in Civil Engineering: I.F. Morrison and C.A. Robb. Of the appointments to the Faculty, that of I.F. Morrison should be considered paramount. Morrison was an inspiring teacher, who was able to stimulate the intellectual zeal of his students. When Morrison noticed he was losing the class he would stop in the middle of a long engineering derivation and describe a practical application and thus regain the attention of the students. His associates were impressed with his ability to inspire the thinking of others. This ability, to reach people, was not confined to honour students. His profound insight on the methodology of design, the hallmark of engineering, was imparted to every student. More important than diplomas are minds thus stimulated! His consuming interest was engineering and, to a lesser degree, the University. He worked tirelessly at his profession for over 40 years.

Professor Ibrahim Folinsbee Morrison, Ibe to his many friends but always Professor Morrison to the students who passed his way, was born in Braintree, Massachusetts in 1889, and lived there until he attended high school in nearby Brookline. Ibe Morrison was brought up in the industrial area of Massachusetts, so engineering seemed a natural career choice. In 1907, he enrolled at Dartmouth College. After two years, he transferred to the Massachusetts Institute of Technology where he received his Bachelor's Degree. While attending MIT he spent his summers in the employ of prominent local consulting engineers and architects. During 1911-1912, he was on the staff of the Department of Civil Engineering at

MIT. Morrison had a distinguished record at MIT. It is speculated that it was at this time he first met Dr. J.A. Allan who was then completing his Ph.D. in Geology. What a fortunate meeting! In 1912, they joined the staff at the University of Alberta, Dr. Allan as a lecturer in geology and Mr. Morrison as a lecturer in civil engineering. The report of the Board of Governors of 1912 records that Morrison was appointed to teach design and work as general assistant in civil engineering at the University of Alberta.

Classes in engineering at the University were discontinued from 1916 to 1919. Morrison joined the United States Army as an infantryman and subsequently served as machine-gun instructor at the Springfield Arsenal in Massachusetts. In the spring of 1918, he was posted to France. In February, 1919, Morrison returned to the University to instruct the veterans of World War I.

During his academic career he was active in research and professional practice. Morrison was the author of numerous technical papers and contributed extensively to technical discussions in both Canada and the United States. The value of his technical work is noteworthy because of the analytical and highly critical approach which characterized all his professional activities.

Morrison's rather incisive remarks often got him into "hot water". His sharp

This overview of the Battle River dam shows the damaged spillway that broke in 1956.

letter to the Edmonton Journal commented on the proposed twinning of the Low Level bridge. He thought it was a monstrous idea and promptly dubbed it "Haddow's (the city engineer) Folly." The Association of Professional Engineers, although privately agreeing with him, had to seek his public apology. Like Galileo charged by the Inquisition, he did recant, but privately maintained that a new arch-supported continuous-girder would be more appropriate than the hideous mass of steel "they" called a bridge.

In the early 1930's, Professor Morrison organized and taught the first courses offered at a Canadian university in the field of soil mechanics. He was author of two elementary texts in the field of properties of materials and pioneered an approach to the teaching of this subject. Over the years he was untiring in his efforts to modify, revise and improve the content of his own courses and of the engineering curriculum in general.

Morrison was widely consulted in all parts of Canada on problems in structures, foundations, and applied mechanics. Projects close to home were the Rossdale Power Plant, the Calgary Power Ghost River Dam, the 109th Street underpass "rathole" and the Exhibition Stadium. As a consultant to the city he contributed to the design of the first water intake structure, the water treatment plant and the last addition to the power plant. Over a long period of years, he, more than any other professional, was called upon for expert advice on engineering matters related to the legal profession.

He succeeded Professor Burgess as Director of Campus Development and was responsible for the design and location of buildings such as married staff quarters on 87th Avenue, "rabbit row"; the infirmary, and the most used building on campus; the "hot caf." All have been removed for more permanent buildings, but the memory lives on.

For 35 years, commencing with the first graduation class, Morrison taught every engineering student at the University. The imprint he made on the minds of his students constitutes his greatest contribution to the Faculty. In recognition of his teaching and professional contributions to the province, the University awarded him an honorary doctor's degree at the fall Convocation in 1953.

Following his retirement, Morrison continued his interest in the activities of the civil engineering department. He was actively engaged in determining the cause of the failure of the Forestburg Dam at the time of his death, in February 1958. His passing ended the last link of the academics who pioneered the Faculty of Engineering at the University of Alberta.

C.A. Robb

The other junior appointment of 1912 was that of Dr. Charles A. (Baldy) Robb, as instructor and later professor of mechanical engineering. Dr. Robb's engineering education began during his childhood in the shops of the Robb Engineering Company in Amherst, Nova Scotia. He graduated from Mount Allison University in Sackville, New Brunswick, and continued his engineering education at McGill, where he received his mechanical engineering degree in 1909. In 1910 he graduated from MIT with a master's degree and served as an appointee with Allis-Chalmers in Milwaukee.

He returned to MIT as an engineering instructor. In 1912, he left to teach mechanical engineering at the University of Alberta and to assist with the extension to the facilities of the University.

During World War I, Robb served as consultant with the Canadian Government for munition production. He toured Great Britain studying thermal plants.

Following the war he returned to Alberta where he gave the service courses in thermodynamics and machine design to engineering students. While at the University, Professor Robb carried out research in lubrication, the operation of the internal combustion engine at low temperatures, and on the combustion of lignite coal. In 1938 he earned his D.Eng. degree from Johns Hopkins University for his research on steam turbine design.

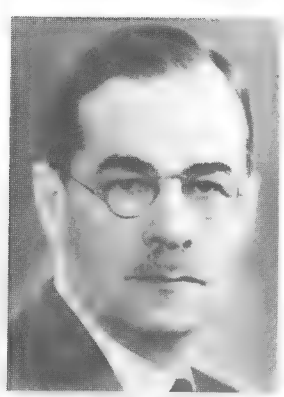
Baldy Robb is not remembered as an engaging or dynamic lecturer. Reports have it that he was thoroughly disliked by the students and by his colleagues. No tears were shed when he left to serve as a consultant to the Department of Munitions and Supplies. His bent was the private sector; he carried on an active practice as a consultant to municipalities on steam and diesel power projects. Robb was an active member of the Association of Professional Engineers. He served on the first council and as their fourth president.

Robb was appointed chairman of the Department of Mechanical Engineering at McGill after World War II. His contacts with industry enabled him to raise funds to re-equip the laboratories at McGill. He retired in 1953. Mount Allison University awarded him an honorary doctor's degree in 1956, in recognition of his long and effective service to the engineering profession.

The formative years came to a close in May 1913, when five students, J.W. Doze, W.M. Fife, C.P. Hotchkiss, M. Brown, and W.H. Draper graduated in civil engineering. In his address to Convocation, May 14, 1913, President Tory noted:

> It is worthy of mention that the five students graduating in Applied Science constitute our first graduating class in Engineering. With regard to the young men themselves, I would like to place on record our sense of their loyalty to the Institution. Three years ago, when we reached the third year of Applied Science, our equipment was not such as would warrant us offering the course in third and fourth years. We suggested to these students that they take their third and fourth years at an eastern university. Instead of so doing, they remained out of college one year, returning to us and completing their courses when the University was ready to give them the advanced work.

Cyrus Hotchkiss and Joe Doze articled as land surveyors and for some 45 years Joe Doze was an active member of that profession. His death in 1958 ended the work of that first class. There are no records available on either Brown or Draper.



W.M. Fife

Walter Maxwell Fife was born in Peterborough, Ontario and attended the Peterborough Collegiate Institute before entering the University of Alberta. He graduated in civil engineering with first class standing and was awarded the John Alexander McDougall gold medal.

Prior to his teaching career Fife was employed as an instrument man for the Dominion Land Surveys and a detailer for the Dominion Bridge Company. From 1913 to 1922, apart from three years service as a Lieutenant in the Canadian Army, he was an instructor and later an assistant professor at the University. He left in 1922 to attend MIT where he was awarded a Master of Science degree and, in the same year, he joined the Institute staff as an Assistant Professor. He was promoted to Associate Professor in 1928.

Fife served as exchange professor at Stevens Institute of Technology for the year 1934-35. In 1937, he and Professor J.B. Wilbur wrote one of the first North

American works on indeterminate structures. Their McGraw-Hill publication *Theory of Statically Indeterminate Structures* was a widely-used textbook in the advanced courses on structural analysis.

A complimentary copy, presented to Professor Morrison, his first professor in structural analysis and his life-long friend, is marked from beginning to end by Professor Morrison's notes, remarks and corrections. Professor Fife died in April 1955.

Chapter 2

A Sound Foundation

The second university residence, Assiniboia Hall, was completed in 1913, providing more classrooms and a home for the new departments of biology and geology. A start was made on the third residence, to be known as Pembina Hall, but a stringent money policy made rapid progress impossible.

In addition, the Government of Alberta authorized the planning of the first main University building, the Arts Building. Two new faculties were organized during the year, the Faculty of Law and the Faculty of Medicine. Cecil Scott Burgess, A.R.I., B.A., was appointed Professor of Architecture in the Faculty of Applied Science.

C.S. Burgess

Cecil Scott Burgess was born of Scottish parents in Bombay, India, in 1870. He was educated at the Royal High School, Edinburgh, Scotland and indentured as a pupil of George Washington Browne, R.S.A., Architect, in Edinburgh. In 1903 he accepted an invitation to come to Canada. He arrived in Montreal where he worked with a French architect, La Pierre. Burgess continued in private practice and was an instructor in the Architectural Department of McGill. Dr. Tory got in touch with Burgess and, in typical Tory fashion, persuaded him to accept the position of Professor of Architecture and supervisor of the physical plant expansion. In 1913, Burgess came to the University to establish the architectural program. When he retired in 1940 the degree course was abandoned. What a major mistake that was! A school of architecture in any city provides a focus and a thrust that brings work to the area. Edmonton has suffered because of that short-sighted decision.

When Burgess arrived on campus, the firms of Nobbs and Hyde of Montreal and Darling and Pearson of Toronto had completed a restudy of the plan of the University grounds that was followed until the 1950's. The Nobbs and Hyde firm was commissioned to design the main University building, the Arts Building, with Burgess supervising the construction. Burgess designed: Pembina Hall, the Plant Pathology Laboratory, the Soldiers Civil Re-establishment Hospital, the University of Alberta Skating Rink, the Orthopedic Hospital, the South Wing of the Main University Hospital, seven residences on University Circle for members of the staff, and a number of University farm buildings.

Cecil Burgess served as private and sergeant in the 66th Battalion during World War I and as an instructor at the Khaki University, Ripon, Yorkshire. Burgess was a member of the Town Planning Commission of the City of Edmonton from 1929 to 1949 and was instrumental in preserving areas now used as parks and community centres, and locating schools in strategic locations. He served on the Board of Examiners in Architecture for 30 years. Burgess was a faithful supporter of the

Alberta Association of Architecture, and served as Secretary and President. His keen mind and unfailing interest in his profession endeared him to all Alberta architects and especially to his pupils. Twenty-one students obtained their B.Sc. degrees while the Department was in existence.

He was awarded an honorary doctor's degree at the Convocation in 1958, for his services to the University and the Province of Alberta. Burgess continued to enjoy life, and maintained an interest in the development of the city. His last work, the home of his friend and University colleague, Dr. John Scott, may be seen at 9035 Saskatchewan Drive, overlooking the river valley. Burgess lived in North Garneau for 30 years following his retirement. He died in 1971, at the venerable age of 101.

A meeting of the Faculty Council of Arts and Science was held in the Faculty Room of Athabasca Hall at 1:30 p.m., Saturday, October 11, 1913. President Tory was in the chair. It was moved by Professor Edwards that the Department of Applied Science be organized as a faculty and called the Faculty of Applied Science, Dr. Allan seconded his motion.

An amendment was moved by Professor Alexander, seconded by Dr. Lewis, that the faculty be called the Faculty of Engineering. Discussion on the motion and the amendment was set aside to permit a general discussion on the name of the Faculty of Arts and Science. Eventually, discussion reverted to the motion of Professor Edwards and the amendment by Professor Alexander. The motion carried; the amendment lost; the Faculty of Applied Science was initiated.

The first meeting of the Faculty of Applied Science was held in the Faculty Room at 9:45 p.m. on Wednesday evening, November 12, 1913. President Tory occupied the chair. Present were Professors W. Muir Edwards (Civil and Municipal Engineering); W.A.R. Kerr (Modern Languages and Dean of the Faculty of Arts and Science); A.H. Lehmann (Chemistry); E.W. Sheldon (Mathematics); R.W. Boyle (Physics); J.A. Allan (Geology); C.S. Burgess (Architecture); B. Fairley (German); and the Registrar, C.E. Race.

The junior members of the staff, who were not members of that first council, were lecturers: I.F. Morrison (Structural Engineering); C.A. Robb (Mechanical Engineering); S.D. Killam (Applied Mathematics); A.D. Cowper (Chemistry); R.K. Gordon (English); A.E. Cameron (Mining Engineering); H.J. MacLeod (Electrical Engineering); and W.M. Fife (Instructor of Civil Engineering).

The items of business were few; the President raised the question of the personnel of the new faculty. He asked for an opinion on younger members of each department serving on the Faculty Council. The Council decided that Heads of Departments and Professors giving full courses should constitute the Council. The President requested all departments to meet on a regular basis with the head of the department in the chair, and a younger member acting as secretary and fully recording all decisions. The meeting adjourned at 10:45 p.m. with the agreement that regular meetings would be held once a month, and would alternate with those of the Faculty of Arts and Science. Applied Science agreed to meet on the second Monday of the month. The meeting date continues to this day.

In retrospect, the discussions at that first meeting were prophetic. Dr. Tory desired a wide representation of academic staff on Council. He was aware of the necessity of dialogue and direct communication. More than 50 years slipped by before the Administration was prepared to accept the principle of participation of all levels of academic staff in the deliberations of the Faculty Council. Now, we have student appointments - a step beyond Dr. Tory's vision!

Before classes commenced in September of 1913, two additional appointments were made to the roster of engineering: Alan E. Cameron, M.Sc., Lecturer in Mining Engineering and Demonstrator in Geology and Hector J. MacLeod, B.Sc., Lecturer in Electrical Engineering.

A.E. Cameron

Alan Cameron was born in London, Ontario in 1890. He was educated at the Ottawa Collegiate Institute. In 1913, he obtained his B.Sc. in mining engineering with honors in geology from McGill. He was granted his masters degree in mining for a study on the combustion of coal in 1914. This work caught the sharp eye of Dr. Tory, who brought him to the University as a lecturer in mining and demonstrator in geology.

During the summers of 1915-1917, he carried out geological explorations for the Geological Surveys of Canada at Great Slave Lake and along the Hay, Buffalo and Beaver Rivers. In 1917, Cameron joined the Royal Canadian Engineers, served overseas, and taught at the Khaki College in Ripon, England. Cameron returned to the University in 1919 as Assistant Professor of Mining, spending his next three summers on exploration for private companies in the north, looking for oil around Great Slave Lake and Lake Athabasca. In 1922, Cameron was appointed Professor of Metallurgy and held that post until 1937. He left the University to accept the position of Deputy Minister of Mines and Public Works for the Province of Nova Scotia.

H.J. MacLeod

The second appointee to the Faculty in the summer of 1914 had a long and influential career. He was a pioneer in electrical engineering education in western Canada. Hector J. MacLeod was born on a farm at French River, Prince Edward Island on May 6, 1887. He attended Prince of Wales College in Charlottetown for one year before moving, with his parents, to High River, Alberta in 1905. He worked on the family farm, taught school for three years and took mathematics courses by correspondence before entering McGill University. In 1914, he graduated with a Bachelor of Science degree in Electrical Engineering and a British Association Medal for highest standing in his class.

Before attending University, MacLeod was a trooper in the 15th Light Horse and continued his military training during his years at McGill. The McGill Contingent of the Canadian Officers Training Corps was formed in 1912, the first in Canada. MacLeod was a sergeant in the McGill Contingent for two years. He received his Lieutenant's Certificate A at Convocation in May, 1914; it would prove useful in a very few months.

For the summer before and the summer after graduation, he worked as a student apprentice in the Canadian Westinghouse plant in Hamilton, Ontario. (It may be of interest to note that it was a ten-hour day, 55 hour week, and the pay was twelve cents an hour). MacLeod's standing on graduation was noted by Dr. Tory and Hector MacLeod was appointed Lecturer in Electrical Engineering at the University of Alberta. There was no electrical engineering department and he was assigned to the Department of Physics under Dr. R.W. Boyle. He gave second year lectures in electricity and magnetism as well as lectures in electrical engineering to civil and mining students.

Military training began with the opening of the session 1914-15, and the Alberta Contingent of the C.O.T.C. was established. MacLeod was appointed Commanding Officer with the rank of Captain. In the summer of 1915 he was attached to the 51st Battalion in Sarcee Camp, Calgary, and qualified as a Captain. Early in 1916 he was appointed Officer Commanding "C" Company, 196th Western Universities

Battalion. At the Spring Convocation, 1916, he received the degree of Master of Science for work in physics under the direction of Dr. Boyle. "C" Company joined the other companies of the 196th Battalion at Camp Hughes, Manitoba in June. MacLeod qualified as a Field Officer and was promoted to the rank of Major. He went overseas in October and served for over a year in France and Belgium.

After the war, MacLeod was awarded a British War Scholarship for graduate study at Harvard University where he specialized in electronics. MacLeod obtained the degrees of A.M. and Ph.D. in physics and he was also offered a staff position at Harvard with half-time for research. He accepted the offer of an Associate Professorship from Dr. Tory and returned to the University of Alberta in July 1921.

The first class of six electrical engineering students graduated from the University in 1924. In the same year, MacLeod was appointed Professor and Head of the Department of Electrical Engineering. Lieutenant-Colonel MacLeod relinquished command of the Alberta Contingent, C.O.T.C., which had been organized as a Battalion under his command. He was in charge of Physical Education "as a favor to the University" at Dr. Tory's request. The University radio station, CKUA, went on the air in 1927 and the transmitter station was also put under his direction. He and his associates in the Department of Electrical Engineering spent weeks each summer rebuilding the transmitter in accordance with improvements in design. The transmitter was of practical value to the Department. Post-graduate work started in 1930 and graduate students, almost without exception, chose electronics as their special field.

Dr. MacLeod's graduate students with M.Sc. degrees were accepted by leading American universities for their Ph.D. programs. He often expressed delight in the large number of his students who were industrial leaders in companies across Canada, or attained distinction in education or research.

Class of 1924 Electrical Engineering

MacLeod took a great interest in the life of the University and the community. He was president and on the executive of the Science Association and the Philosophical Society. He was a member of the Engineering Institute of Canada and

Vice-President of the Association of Professional Engineers in Alberta at the time of his departure from the Province.

In 1936, he accepted an invitation from the University of British Columbia to become Professor and Head of the Department of Mechanical and Electrical Engineering. This position offered challenging work at a considerable increase in salary. In 1939, MacLeod was appointed technical advisor to the Public Utilities Commission of B.C. He held this position for five years and gained experience in the operation of public utilities that would serve him well.

MacLeod became Dean of the Faculty of Applied Science at UBC in 1950. At that time the Faculty had an enrolment of over 1,100 students. First year engineering students had the good fortune to know the Dean in their formative years. He gave a weekly lecture on the history of technology, engineering and science. His qualities of kindness, good taste and excellence endeared him to his students and his colleagues. MacLeod retired in 1953.

His leadership was cherished at UBC; he was appointed Dean Emeritus, and asked to continue as Chairman of the Committee on Senior Appointments and the Chairman of the Committee for University Research Grants.

During World War II, MacLeod served as a research physicist for the National Research Council. He was awarded the Order of the British Empire (Officer class) in the King's Birthday Honor's List (1943) "for valuable public service in connection with scientific research." He was made a Fellow of the American Institute of Electrical Engineers in 1945, the first Canadian honored west of Winnipeg. UBC commissioned the painting of his portrait by Charles Comfort. It hangs in the Common Room of the electrical engineering building, completed in 1963, and named the Hector MacLeod Building.

A.J. Cook

A young man of Scottish descent, A.J. Cook, was awarded a first year scholarship in Applied Science at the University in 1914. He held the second year scholarship as well and was awarded the Governor General's Silver Medal in Applied Science. Cook enlisted in the Canadian armed forces in World War I. He must have been severely shell-shocked, for on his return to the University in 1918 he switched to mathematics. He graduated in May 1920, with first class honors in mathematics and began teaching in the Department of Mathematics the same year.

The teaching load was heavy, often fifteen hours of lectures a week, but Professor Cook found time to work for his A.M. degree at Harvard, obtained in 1923. He was appointed Lecturer in Mathematics in 1924, and spent his summers at the University of Chicago where he earned his Ph.D. in 1929.

For nearly 30 years he taught mathematics to all second year engineers at the University, many of whom found his crazy antics similar to those of Professor Sheldon. His interest and concern for his students were readily apparent. In 1946, he was appointed Advisor to Student Veterans. In 1950, with the rank of Professor, he was appointed Director of Student Advisory Services, later known as Student Counselling Services. His care and concern for the students' health and welfare reached out to all. He served in that caring role until his retirement in 1961. He returned to part-time teaching for 1963 to 1965, and thereafter, he was a constant visitor to the campus until his death in 1977.

Chapter 3
World War I

With the appointments of Cameron and MacLeod, the nucleus of the Faculty of Applied Science was in place. The faculty necessary to provide courses leading to degrees in civil, mining, and electrical engineering were present. When World War I broke out the patriotic impulse that swept Canada was evident at the University. Before the 1915 session opened it was apparent that many of the staff members and students would enlist. The engineers and physicists were the first to go.

When 1916 drew to a close 14 staff had joined the armed forces or had been seconded to essential services related to the war effort. Six of the engineering staff were away. Billy Boyle joined Sir Ernest Rutherford in Manchester to work in research connected with the detection of submarines; Hector MacLeod accepted an appointment as Officer Commanding "C" Company, 196 Western Universities Battalion; Charlie Robb was appointed to the Munitions Board in Ottawa; Max Fife accepted an appointment as a Lieutenant in MacLeod's "C" Company and Ibe Morrison, with a year's leave of absence for special study relating to structural design, joined the American forces. Alan Cameron joined the Royal Canadian Engineers and taught at Khaki College in Ripon, England. Burgess failed to secure a commission; he accepted the rank of Quartermaster-Sergeant, 66th Battalian, C.O.E.F.

Professor Edwards was left to oversee the work of the faculty. In 1914, the growth of the work in the industrial laboratories had reached such dimensions that it was necessary to create a new office through which all commercial work done by the University would be regulated. Edwards was appointed Director of Industrial Laboratories. The laboratories provided assistance to the province for well over 50 years. It served as the materials testing centre in areas of industrial expansion. Most of the work was conducted in the laboratories of the engineering faculty by members of the staff. They were performing a function similar to the land grant universities of the United States.[5]

The war dragged on and all of the students in Applied Science enlisted; one was not accepted. This student was bundled off to McGill, in 1918, to take specified courses required to complete his engineering degree. He passed and we are fortunate that he returned to Alberta. He played a founding role in Alberta Concrete Products and, in later years, established the E. Skarin Foundation which has aided the University and its students for many years.

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[5] See appendix IV

The Arts Building was formally opened in 1915, and the Civil Engineering Building (South Lab) was started. No other construction took place until late 1918 and early 1919 with the extension of the South Lab to house Household Economics and Dairying and the start of construction for a new laboratory for the Mining Engineering Department and the Department of Agriculture (North Lab).

The return of the service personnel in the autumn of 1919 swamped the young University. Never had the place been so bustling and crowded! The residences were jam-packed, classrooms overflowed and a new era dawned at the University of Alberta. With the crowds came the influenza epidemic, which took the lives of many students as well as the life of Professor Edwards. Edwards served as Admissions Officer of the University residences, then used as a hospital.

Following the death of Edwards, arrangements were made with Mr. A.W. (Bert) Haddow, City Engineer of Edmonton, to assume Edwards' teaching duties until a suitable replacement could be found. Although Bert Haddow served the Faculty for a short time, his interest remained throughout his lifetime. He was the fifth staff member to serve as President of the Association of Professional Engineers (1936).

The young men and women who served their country during World War I received special benefits which permitted them to complete their high school requirements and enter University. Facilities in engineering were put to the test and the workload of the staff sky-rocketed; new staff were acquired. One of the new appointments was that of Robert Starr Leigh Wilson as the replacement for Professor Edwards.

R.S.L. Wilson, Dean of Engineering 1929-1946

Wilson was born in Lunenburg, Nova Scotia in 1885. He was awarded his B.Sc. degree in civil engineering with great distinction, from McGill University in 1911. He spent the next eight years in engineering practice in the construction business.

In 1919, Wilson came to the University as an expert in railway construction. He was Professor of Civil and Municipal Engineering and became Dean of the Faculty in 1929. He held these positions until his early retirement in 1946. During his years at the University, Wilson was a tower of strength not only in the Faculty but within the University as well. Student enrolment steadily increased. Wilson was particularly effective in his dealings with students. The graduates of his period recall the sympathetic and patient consideration he gave to their individual problems.

In the early years of his career at the University, Wilson exerted a profoundly unifying force on the engineering profession in the province. He was a prime mover in the passing of the Engineering Profession Act in 1920. He was a charter member and served as the first Registrar of the Association of Professional Engineers from 1920-1926. For many years he served as member of Council and Chairman of the Board of Examiners. In 1928 he was elected President of the Association.

Without question, his greatest contribution to the Faculty came when the World War II veterans attended the University. Over a period of two years he organized the Faculty to accommodate a threefold increase in student registration. The students sought his counsel for their personal as well as their academic problems. Many student veterans have acknowledged that without his advice and stimulation they would have abandoned their university careers. His greatest tribute is the success of so many of the student veterans, now spread over Canada. Those who knew him learned a deep-rooted concept of the dignity and worth of mankind.

Wilson was dearly loved. Although his lectures were long out-of-date, his students, by a fixed schedule, made certain that half the class was always present

when he lectured. He gave two courses - C.E. 74 , Land Transportation and C.E. 77, Construction Engineering. To this day, no one has the slightest idea what was supposed to be in those courses.

But all can recall the stories of the building of the Ontario Temiskaming Railway, with the Irish foreman, Big Red McMartin "with hands as big as hams." Wilson was a raconteur par excellence. Whenever he attempted to give a serious lecture, one of the students would innocently ask a question about the Ontario railway - Wilson would lean back in his chair, and reach into his vest pocket for his cigarette holder. We were not cancer conscious in those days, and we would "roll our own", relax and hear another episode of Big Red. The only trouble was...exam time!

Dean Wilson thought he had covered certain material, but all we knew was the depth of the snow on the Ontario-Quebec border, the suffering of the sleigh dogs, and Big Red and his crew. The Dean could never understand why performance in his courses was so miserable compared with other courses. He solved the problem by giving out 20 questions at the start of each course. He chose five of them for the final examination - at least now there was a chance.

In 1946, Dean Wilson retired to Victoria, where many of the staff visited him to keep him abreast of events in the Faculty. From the day he left until his death at the age of 82, he never again set foot on campus.

Industrial group at Cadomin, Cameron, Pitcher in front row.

The Department of Mining and Metallurgical Engineering had its beginning in 1914 in the Department of Geology. Dr. J.A. Allan was head and Alan Cameron the principal lecturer. Rapid growth followed World War I, and Allan relinquished his position to devote full time to Geology. Professor Norman Charles Pitcher was appointed Head of the Department in 1920. Pitcher came to the University after an extensive and diversified career. He had graduated from McGill in 1899 and immediately took a position with the Dominion Coal Company of Nova Scotia. There, Pitcher rose through the ranks from blueprint boy to chief construction engineer. In 1909, he came west to the Province of Alberta, where he was in charge of construction of the Gault No. 6 Mine for the Alberta Railway and Irrigation

N.C. Pitcher

Company, now the C.P.R. During his first ten years in the province, Pitcher was associated with the Canadian Coal and Coke Company at Kipp, the Beaver Mines at Lovett and the North American Colleries, where he was General Superintendent and later General Manager. It was at this time, that Pitcher accepted Dr. Tory's offer to head the Mining Department at the University.

During the 25 years he served as head of the department, 214 students graduated and carried their practice to five continents, with many of them reaching positions of responsibility. He contributed to the success of these graduates by offering wise counsel and practical instruction. His students considered him a walking encyclopedia on mining matters and many of them returned to consult him on problems encountered in the field. His advice and counsel was sought by government agencies on various enquiries related to the coal industries and on industrial relations. Pitcher retired from the University of Alberta in 1945.

In 1919, over a thousand students registered for classes in the University, 71 in applied science. Thirty-two new staff appointments were made in 1920, three of whom, appointed to the Faculty of Arts and Science, were to maintain a very close association with the Faculty of Applied Science.

Dr. O.J. Walker, Dr. J.W. Campbell, and Dr. P.S. Warren were friends of the Faculty throughout their long careers. No student registered in engineering could escape the gimlet eye of "O.J." as he faced the overflowing classroom in Med 152, writing over his right shoulder with his left hand as he spewed forth five to six pages of inorganic chemistry. Like the Ancient Mariner, "he held them with his glittering eye, they could not choose but hear." Students, for over 30 years, learned their mechanics from the lectures burped forth by Dr. Campbell. Dr. Warren, in his gentle way, taught many of them geology; and as Provost forgave them for their many pranks. Engineers and engineering played a vital role in their careers.

O.J. Walker

O.J. Walker was born at Portage la Prairie, Manitoba, in 1892, and was brought up in the North Battleford area. He entered the University of Saskatchewan and was their first Honors Chemistry graduate. Walker took his master's degree at Harvard and entered McGill as a National Research Council Fellow in 1917. On completing his Ph.D. in 1920, he came to the University of Alberta as an assistant professor of chemistry. He was appointed full professor in 1934, and became Head of the Department of Chemistry in 1942. In addition to serving as head of chemistry, he assumed the responsibility of guiding the rapidly growing School of Graduate Studies. After his retirement, the School was raised to the rank of a Faculty, with a full-time Dean, Dr. A.G. McCalla.

Walker's ability as an analytical chemist was widely recognized. He was a Fellow of the Chemical Institute of Canada and of the Royal Society of Canada. Chief among his early achievements was a survey of the iodine content of Alberta waters. These studies related iodine shortages with goitre conditions. The published accounts of his work lead to the widespread use of iodized salt. The study marked the beginning of his interest in water which lead to his best known work on fluorine in drinking water and its relation to mottled enamel of teeth and tooth decay. He was a firm supporter of fluoridation of water supplies low in fluoride content. Walker was an expert analytical chemist. He carried on an active private practice and was fond of relating that in a single summer and after many thousands of determinations he paid for his beautiful home on Saskatchewan Drive.

O.J.'s reputation as a tough professor (he eats freshmen) was more of a myth than a reality. It was claimed that the children of early graduates could use their

parent's notes and skip many of his classes. Nevertheless, those who were registered in Chem 40 got a very sound background in inorganic chemistry.

In the Faculty of Applied Science, the chemical engineers received the benefit of his lectures and guidance and without Dr. Walker the "Industrial Tour" was not a success. He knew all the plants, all the people, all the places of good cheer. At times it was difficult to tell who was chaperoning, Dr. Walker or the student nominated to look after him. These outings endeared him to the hundreds of students he led through the chemical plants from Trail to Sarnia. On committees and faculty councils, his sound judgement and his unassuming friendliness of manner endeared him to his colleagues. He loved the mountains and the outdoors and his cottage at Lake Edith in Jasper Park was a constant joy to him and to the many friends who visited him there.

J.W. Campbell

Dr. Campbell was born in Scotch Block, Ontario, attended Queen's University where he graduated in 1913 as medalist in mathematics. He received his Ph.D. degree from the University of Chicago in 1915, and for a short time was on the staff of Wesley College in Winnipeg. Campbell joined the army in 1917 and served overseas with the Artillery. For a short time after the war, he taught in Tory's Khaki University at Ripon. Campbell was on staff of the University of Iowa in 1920 when Dr. Tory persuaded him to join the mathematics department at the University as an Assistant Professor. He became a full Professor in 1925. His text book "An Introduction to Mechanics" was a model of careful statement and accurate use of units. He published several papers on the problem of flexible cables under varying conditions of load and temperature, and prepared a most useful set of mathematical tables which included hyperbolic functions.

It was during this era that he wrote a well-received scientific paper proving man could never encapsulate sufficient energy to propel a space vehicle outside the earth's gravitational field. "Man can never get to the moon." How little we know! How much we have to learn! Man's ingenuity, time, and resources can overcome the impossible. Escape to outer space, from the impossible to a regular occurrence took place in less than one generation.

Campbell gave a course on gunnery during World War II, and he and Professor Keeping conducted a long series of experiments on the stability of liquid-filled artillery shells for the National Research Council. When the contraption they called a test rig was wound up to check the rotation of the shell the inhabitants of the South Lab: Engineers, House Ecers and Dairy Scientists feared for their lives. It was safer to be in action overseas than to be close to that test room. Luck was on their side, everyone survived.

Campbell succeeded Sheldon when he retired in 1947 and guided the department through the heavy burden brought on by the increased numbers of student veterans. He recruited new graduates, Fostvedt, Jacka, Dalsin and Roshko to carry the load at the junior level.

Campbell was active in astronomy in Edmonton and was responsible for the acquisition of the small University Observatory which stood for years at the west side of the campus. His weekly astronomical notes in the Edmonton Journal had a large following. He died five months after his retirement, at the age of 65.

In 1922, the third appointment of note was that of Percival Sidney (Per) Warren. Although not as closely associated with the Faculty of Applied Science his papers, and more importantly his lectures, laid the foundation for the stratigraphy upon which much of the oil exploration in Alberta is based. He was a longtime member

of the Association of Professional Engineers of Alberta and a charter member of the Alberta Society of Petroleum Geologists.

P.S. Warren

Dr. Warren was born on a farm at Brechin, Ontario in 1890, near Lake Simcoe and the Trent Canal. The brachiopods of the outcroppings attracted his attention in his youth; his collections from along the canal gave him an early insight into natural history and a long-time love of fossils. He attended Orillia Collegiate and had decided to become a medical doctor, but ill health led him to take work on a survey crew in the mining camps of the Cobalt area. His education at Toronto was interrupted by World War I and he went to Europe, a member of the 26th Battery of the Canadian Field Artillery. He fought in the Battle of the Somme and at Passchendaele; he was wounded and sent back to England. This earned him the opportunity to attend Khaki University and a chance to visit classic stratigraphic sections of England. The Chalk and Gault fossils in the University Collections were obtained at that time.

After World War I, Warren completed his formal education at the University of Toronto receiving his B.A. in 1920 and his Ph.D. in 1924. That year, Dr. Allan doubled the staff in the Department of Geology with the appointment of Per Warren. Soon they were joined by a native Albertan, Dr. R.L. Rutherford, and for 25 years that remarkable trio represented geological education in Alberta. Warren succeeded Allan as Head of the Department in 1949 and held the position until his retirement in 1955.

Group picture: I.F. Jones, J.A. McDonald, H. Moon, R.T. Hollies, J. Millen, P.S. Warren (centre), *The first Master of Science (M.Sc.) in Engineering obtained in 1921. The thesis Title was "Preliminary Investigation on Weathering of Alberta Coals".*

Dr. Warren never lost his connection with the military scene and during World War II he was Lieutenant-Colonel in Command of the C.O.T.C. at the University. He continued to lecture in military geography and military history years past his retirement. He was an expert on the Peninsular campaigns of Wellington. Per Warren was Provost and Dean of Men during the postwar years when World War II veterans attended the University. His understanding of the needs of these young men made him a favorite with them. He was chairman of the Men's Athletic Board for many years and a strong advocate of intercollegiate sports.

Warren acted on the advisory boards of the Research Council of Alberta and the

Geological Survey of Canada. His overview of the many fields of geology inspired students in introductory geology. He was one of the best lecturers at the University. Knowledge was to be shared, and Warren generously dispensed it to students, to colleagues, to oil geologists and to paleontologists throughout the world. In the late forties and early fifties his office was a clearing house for stratigraphic information and his lectures processed the raw well data into cohesive paleogeographic and correlative sequences long before they were presented as scientific papers. The wildcat drilling of one week became the stratigraphy lectures of the next.

Dr. R.E. Folinsbee, one of his pupils, succeeded him as Head and his lectures and classes were taken by another of his students, Dr. C.R. Stelck, whose interpretative skills continued the work initiated by Per Warren.

S.C. Morgan

There was one appointment to the Faculty of Applied Science in 1921, Stanley Chapin Morgan. Stan Morgan was born in Elgin, Ontario in 1892. He attended Queen's University and received his B.Sc. in electrical engineering in 1917. He spent a year in the Royal Canadian Air Force and after a stint with the Westinghouse training course, he returned to Queen's as junior instructor. He joined the staff at the University as a lecturer in physics in 1921. Morgan received his Master of Science degree in Physics in May, 1924, and joined the Faculty of Applied Science as an Assistant Professor. In 1927, he was accepted for graduate study at the California Institute of Technology, and resigned from the University to work on his Ph.D. He had just completed the course work required for a Master degree in Electrical Engineering when Queen's University induced him to return. There he stayed until June 1937 when Hector MacLeod persuaded him to join the Department of Electrical Engineering at U.B.C. as an Associate Professor. He was appointed Professor in 1943 and held that position until his retirement in 1956.

Chapter 4

The Post-War Years

World War I ended in 1918. Registration in Applied Science rose from 15 in 1918-19 to 81 in 1921-22 and in the 1922-23 session the 100 mark was broken. Enrolment in the University approached the 1300 mark, making Alberta the fifth largest University in Canada, a surprising achievement in such a short time.

Along with the swelling enrolment came the formation of many of the faculty clubs, each espousing its own cause. So it was with engineering. At a regular meeting of the Civil Engineering Club on December 3, 1919, it was moved by Frederick James Batson[6] and seconded by Harry Webb that an engineering club should be formed. A committee of five, one representative from each of the four years and one from Arts and Applied Science, was appointed to draw up a constitution. The executive of that young club met under the Presidency of Harry Webb. Dr. Tory was chosen as Honorary President, H.T. Butchard, a veteran of World War I, who became a distinguished mining engineer, was Vice-President and E.G. Patterson, a first year student who later dropped out of engineering, acted as Secretary-Treasurer. The representatives were J.W. Lewis from fourth year; W. MacDonald from third year; W.G. (Bill) Jewitt, who became the flying geologist for Consolidated Mining and Smelting, was the second year rep; while a Glaswegian, Jimmy MacMillan, a veteran from the 49th Battalion, was the elder statesman as well as freshman representative. Three years later Jimmy MacMillan was to become president of the Club. While an undergraduate, Jimmy had expressed his ambition to become the President of Westinghouse. The Association of Professional Engineers were fortunate that Jimmy hired on with Calgary Power, to become their chief purchasing agent. He gave devoted service to the Association, serving as the 26th President in 1945.

The first club was named "The Undergraduate Society in Applied Science," but that was a mouthful for the engineers. They shortened the name to "The Applied Science Society." On November 22, 1922, a revised constitution was adopted and on March 14, 1923, the name was changed to the "Engineering Students' Society" to be known from then on as the ESS. A membership fee of $1.00 was set. A distinctive faculty pin was designed and worn by all engineers.

On November 1, 1923, the first ESS banquet was held, with great success, in the MacDonald Hotel. The banquet became an annual highlight of engineering activities on the campus, getting bigger and wetter each year, until the spring of

[6] Batson served in World War I and returned to the University to complete his engineering degree. He graduated in 1920.

1941, when the engineers piled up like cordwood in Athabasca Hall. The banquet was prohibited for four years. What a shame! Souvenirs such as towels, silver flatware, goblets, demi-tasses, and ashtrays were no longer on display in the residences. The banquet was restored in 1945 but the reluctance of the town establishments and the lack of enthusiasm on the part of students soon brought that form of revelry to an end.

First Executive of ESS

Pres H.R. Webb	4th yr rep	J.W. Lewis
VP H.T. Butchard	3	W. MacDonald
Sec E.G. Patterson	2	W.G. Jewitt, Jim McMillan

Engineers fight 1937.

ESS pin

The yearly high-jinks of the engineering society were eagerly anticipated. The rowdy homespun yells that resounded at all sporting events threatened them with expulsion. The annual tribute to Professor Hewetson, their beloved political economy professor, was a Valentine party which overflowed the largest lecture hall. Enthusiasm reached its peak with the annual elections. The campaigning, an unofficial parade through the arts and the med buildings with Godiva astride her white horse, brought out the crowds and sometimes the ire of others. They disrupted classes and laboratories with their boisterous chants and blaring music. The annual feud with the meds culminated in the Battle Royal in '37 and was brought to an end by Presidential decree. The ESS turned its enthusiastic attention to the Aggies who refused to fight fairly! The farmers resorted to chemical warfare and stunk up the place. The various attempts at producing and editing a faculty newspaper have brought on the wrath of the governing body, causing cancellation of the beloved "Engineers' Gateway" for a period of years. Now, the engineers have their own press and, from time to time, come out with the "Bridge," but it lacks the finesse of those earlier literary attempts.

'Engineers' Gateway - January 31, 1950 PSALM 151

Verily, I say unto ye, marry not an engineer,
For an engineer is a strange being and possessed of many evils.
Yea, he speaketh always in parables which he calleth formulae,

He wieldeth a big stick which he calleth a sliderule,
And he hath only one bible, a handbook.
He thinketh only of strains and stresses and without end of thermodynamics,
He showeth always a serious aspect and seemeth not to know how to smile.
He picketh his seat in a car by the springs thereof and not by the damsels.
Neither does he know a waterfall except by its horsepower.
Nor a sunset except that he must turn on the light,
Nor a damsel except by her mass.
Always he carrieth his books with him, and he entertaineth his sweetheart with steam tables.
Verily though his damsels expecteth chocolates when he calleth, she openeth the package to discover samples of iron ores.
Yea, he holdeth her hand but to measure the friction thereof, and he kisseth her only to measure the viscosity of her lips,
For in his eye there is a far away look that is neither love nor longing – rather a vain attempt to recall a formula.
Even as a boy he pulleth the girls' hair but to test its elasticity,
But as a man he deviseth different devices,
For he counteth the vibrations of her heartstrings
Even his own heart flutterings he counteth as a measure of fluctuations.
He enscribeth his passion as a formula,
And his marriage is a simultaneous equation involving two unknowns
And yielding diverse results.
Verily I say unto ye, marry not an engineer.

In the early days, and well into the sixties the ESS was the centre of all engineering activities. Students met together, planned together, worked together, played together and together paid the price for their enthusiastic enjoyment of university activities. They believed in organized democracy. Candidates for various University students offices sought out the engineers to support them and support them they did! Several hundred votes were ready for any cause, and when needed, the seniors would move into the large drafting room classes of first and second year and, row by row, march the students out to the polling booth telling of the glories of the candidate they were about to support.

Monthly meetings were held throughout the school year and the ESS brought in guest speakers from all branches of the professional community to alert the young engineers to the opportunities that awaited them. Cigar and cigarette smoke polluted the air, cokes and doughnuts were consumed, songs were sung to old familiar tunes, house dances were sponsored, and slide-rule contests held.

The glory days are gone! The engineering student body is now so large that each department has a club. They enjoy interdepartment hockey games and sports, but as a faculty they come together only once a year for Engineering Week. At that time classes, but only those in engineering, are disrupted by marching bands and chorus lines introducing young ladies who are striving to be the Engineers' Queen. A spirited week of high-jinks with boat races, the beer drinking contest, keg races,

skit night, scavenger hunt, and snow sculptures highlight activities which garner points for the election of the "Queen." Flashing red and blue lights of the prowl cars are frequently seen on and about the University. Queen candidates are kidnapped and held for ransom; the telephone of the Dean of Engineering rings continuously. The University loves every minute of it! The boisterous enthusiasm of these young people removes the chill from our cold winter days.

The main social functions at the University were the Junior and Senior Proms but they were not engineering-oriented. In 1936, the ESS was chosen to sponsor the undergraduate dance in Athabasca Hall. It was an outstanding success! Two years later, during the presidency of Leroy (Chick) Thorssen, the first annual ball for engineers was held in Athabasca gym. The entrance to the dance was through a mine completely fabricated by the mining class. The punch was served from a glass model of a refinery, huge sparks danced up and down a Jacob's ladder designed by the electricals, while a large hydro plant complete with cascading falls, was the civil exhibit. The Engineers' Ball became a highlight of the social functions. Each year the Ball grew in size and the displays became more elaborate. Finally, curbs of time and money had to be imposed. The display competition became so intense that many third year students missed classes and assignments and were on the verge of failure.

The Ball was always a model of decorum. The fourth year class organized the Ball and six or seven of the biggest seniors were delegated to police it. Anyone who showed signs of losing his equilibrium was quietly removed, his girlfriend put in one taxi, and he in another, and sent home. The chewing out the young man received from his former girl friend either drove him to more drink or to become a teetotaler.

The success of the Ball required it to move from Athabasca gym to larger halls off campus for a time. Displays continued to attract crowds and bring praise and glory to the various classes, prizes were offered by over town sponsors and the winning model was prominently displayed in the main window of "The Bay."

But success was not enough. Like John Wayne our shy chauvinists needed someone to mother them. They decided they needed a Queen. In 1944, Virginia Thompson, a campus belle, was chosen "Queen of the Ball." The second Queen was one of their own; a very popular electrical engineering student named Muriel Smith (Cheriton)[7]. The third Queen was a civil engineering student Virginia Webb

[7] Muriel Smith (Cheriton) was the second woman student in the Faculty; and the second woman student in the Department of Electrical Engineering. (Esther Rabkin convocated in May, 1935, with a B.Sc. in Electrical Engineering). The lone woman in her classes, she was "teased a bit; I was treated very well. I had a classroom of brothers, and most importantly, I was always part of the group." Students attended University for ten hours daily, plus classes on Saturday from 8 AM until 12 noon. Four to six hours per week of volunteer work were requested of students at the University during World War II. Smith washed test tubes at the blood donors unit, learned Morse code and assembled information on poisonous gases. Hard work was combined with fun; Muriel Smith was the 1945 Queen of Engineering.

After graduation, Muriel married Ross Cheriton and with her husband, who graduated in engineering physics, moved to British Columbia and then Ontario. Although Muriel Cheriton worked in engineering in Toronto, women were not designated for jobs with the potential for building a career. She is convinced that careers for women were not given long-range consideration in the fifties. Employers believed that priorities were different for women in the work force. This attitude was not confined to engineering, it reflected the prevalent outlook on working women. "I came into my own in 1963." The family (six children) moved back to Edmonton and Muriel and Ross Cheriton established an engineering consulting firm. "I was working in my profession and making the decisions necessary for the successful operation of a consulting firm."

(McKay), the eldest daughter of the late Professor Webb. The point system was introduced in 1947. A Queen is chosen, based on points the engineering clubs receive by competing in events during Engineering Week. The excitement and activity surrounding the accumulation of points for Queen of Engineering has become a highlight of the year.

Along more serious lines engineering students through their various clubs or through the ESS have participated in all the major University drives. Many have held offices in the Students' Union and other campus clubs. In 1925, under the strong urging of Professor Morrison, the subject of student papers came to the fore. The following term impetus was given by offering a cash prize for the best paper. The ESS invested its surplus funds in a government bond and the interest was used to fund the prizes. In 1943, the presentation of undergraduate papers was named the "Webb Memorial Competition" in honour of the late Professor Webb, the first president of the Society.

In 1926, Dean Boyle gave a talk to engineering students and stressed the need for humanities in engineering education. That year, the inter-faculty debates were won by two engineering students, the Fisher brothers, in competition with two law students. Participation in sports and extracurricular activities plus high scholastic records have brought two Rhodes Scholarships to the Faculty of Engineering. The first Rhodes Scholar was Dr. E.H. (Ted) Gowan, an electrical engineer, who became a professor in the physics department at the University and the second Rhodes Scholar was Dr. John Duby, a 1952 graduate in chemical engineering. In 1956, Duby returned to the University where he joined the Department of Civil Engineering to teach mechanics. He was one of the group in applied mechanics who, in 1958, moved into the newly formed Department of Mechanical Engineering. Six years later Duby resigned to go into private practice in Alberta's oil patch. Over the years, engineering students who participate in student societies at the University develop leadership skills that have been sought by industry, government and renowned universities.

The end of World War I brought on an infusion of students and also expanded the vision and scope of the University. In October, 1919, at the instigation of Dr. Tory, the first meeting of a committee to advise the Government on matters relating to industrial research was held; the chairman was H.J. Cote, Provincial Secretary. In January 1921, an Order-in-Council stated that the members of the advisory committee were encouraged by the preliminary survey of the mineral resources of the province and the possibility of the development of these resources. It was decided to continue this pursuit in close cooperation with the University. A council of five members to be known as "The Scientific and Industrial Research Council of Alberta" was appointed, with necessary powers to supervise and direct research work, to engage specialists for the work, and to enter into agreements with the University for the necessary laboratory and other facilities. The University was given the responsibility of securing competent research people and for the structure and maintenance of the organization. The direction of the council came under a committee chaired by the Provincial Secretary, H.J. Cote. The members were President Tory, Professors J.A. Allan and N.C. Pitcher, and Mr. J.T. Sterling, Chief Inspector of Mines. In brief, the Research Council of Alberta had been in existence since October 1919, but was not formally constituted until January, 1921. The Technical Advisory Committee was for many years chaired by the President of the University with members drawn largely from the Faculty of Applied Science and the

K.A. Clark

Department of Geology.

In 1920, Dr. Tory, who was always alert to new developments, invited Karl Clark to accept a position with the proposed Scientific and Industrial Research Council of Alberta. Clark accepted and became the first staff member of the first provincial research council in Canada. Dr. Clark was a Bilateral-Research Professor in the Department of Industrial Research at the University with emphasis on the utilization of the Athabasca Oil Sands. Clark's major interest was the successful development of that vast resource.

Karl Clark was born in 1888 at Georgetown, Ontario. He attended McMaster University, where he obtained his B.A. degree in 1910 and an M.A. degree in inorganic chemistry in 1911. He received his Ph.D. in Physical Chemistry from the University of Illinois in 1915. It was a great disappointment to him to be rejected by the army during World War I because he was dedicated to the belief in service to one's country.

He returned to Canada to work for the Federal Government in the Department of Mines and Geological Surveys. When he worked in Nelson, B.C. for the survey department, he met and married Dora Wolverton. Clark saw the potential of the oil sands as an alternative to conventional petroleum at an early stage of his work. He recognized the importance of solving the practical problems that hindered the economic recovery of oil and devoted his career to mastering these problems. It is

A Bird's eye view of Syncrude's fluid cokers.

S.M. Blair

a tribute to his persistence and sound judgement that the plants now in production utilize the hot water flotation process substantially as he developed it. The efforts of Clark and his graduate student, S.M. Blair, in finding a way of separating oil from the sands resulted in a method that was tried successfully at a plant at Dunvegan in 1923. Several small plants were built to demonstrate the hot-water washing method of separating the oil from the sand. Two larger pilot plants sponsored by the Government of Alberta were built under his direction on the Clearwater in 1930 and at Bitumount in 1949.

The great depression of the thirties knocked out the Alberta Research Council from 1932 to 1943. Dr. Clark continued his work in the Department of Industrial Research. In 1936 and 1937, he and his colleague, Sid Blair, were in London and Trinidad working on methods to develop the tar deposits on that island. Dr. Clark was reticent about this period of his career, except to say he hated custard, Brussels sprouts and didn't much care for Englishmen.

In 1938, when Professor Cameron departed for new adventures in Nova Scotia, Clark joined the department of Mining and Metallurgy. He was appointed Head of the Department in 1947, and held this post until his retirement in 1954. The students in metallurgy and others who attended his classes came to recognize the strength and determination of this quiet spoken, kind, gentle person. They learned more than the technical aspects of metallurgy from him, they learned the wider significance of truth, responsibility and devotion to a cause. His students and colleagues became his friends, among them were Sid Blair, Max Ball, Bill Jewitt, Ross Wardle, Sid Ells, Dave Pasternack, Jack Oberholtzer, Bert Lang and a host of others. He sat on the Council of the Faculty of Applied Science for 35 years; and his sound judgement and gentle manner helped guide the Faculty.

His first graduate student and life-long friend, Dr. S.M. Blair, undertook a feasibility study of extracting oil from the tar sands in 1951. The economic feasibility report led to the vast developments now in place. The long term value to Canada of the work of Blair and Clark may be judged from the fact that the oil reserves in the sands have been estimated as high as a trillion barrels. Their fundamental research led to the mega projects at Fort McMurray. The cost of this research was recovered from the royalties obtained in less than one month's operation of the first small plant. It would be a farsighted concept for industry to grant the University

Tar Sands at Fort McMurray Alberta, 1942.

The modern Suncor plant.

one-tenth-of-one per cent of their annual profits for research to enhance our industrial effort within the province.

During his career he was author or co-author of some 50 contributions to scientific literature and trade journals, mainly on the oil sands. In 1954 he was invited to write a section in the Encyclopedia of Chemical Technology on "Tar Sands." In view of his important work on the oil sands, Dr. Clark was the recipient of the 1955 Gold Medal Award of the Professional Institute of the Public Service of Canada for outstanding achievement in the field of Applied Science. It was the first time that the award had been given to a scientist in Canada outside the federal government service. With the medal, came a congratulatory note from Prime Minister Louis St. Laurent.

Karl Clark's interests were widespread. He was a devoted member of his church, and he played the clarinet in the Sunday School orchestra. While at high school he delivered telegrams and became a proficient telegrapher. He loved the outdoors and was an ardent canoeist, skier, and snowshoer. He played badminton and loved to make movie films. He always had a garden, not flowers but vegetables! He was a beekeeper and a member of the Beekeeper's Association. His great passion was music, a devotion he shared with his entire family. He was a charter member of the Civic Opera Company and for many years was a member of the Edmonton Symphony Orchestra. His friends and acquaintances were many and his memory will live with each of them. He moved to Saanichton, B.C. in 1964, nine years after his retirement. He died there in December, 1966.

Edgar Stansfield

The second appointment to SIRCA, and to the Department of Industrial Research was Professor Edgar Stansfield, who served the Research Council and the Faculty for 25 years. Edgar Stansfield was born in Bradford, Yorkshire, England. He graduated in honours chemistry from Victoria University, Manchester in 1900, and obtained his M.Sc. in 1903. He taught at Sunderland Technical College, England for three years following his graduation and came to Canada in 1906 to join the staff of the Dominion Iron and Steel Company in Sydney, N.S. He left Sydney the following year and moved to Montreal where he made a study of Canadian coals at McGill for three years. He transferred to the Fuel Testing Division of the Bureau of Mines in Ottawa in 1910 and from 1917-1921 he was the Chief Chemical Engineer to the Lignite Utilization Board. President Tory asked him to join the newly formed Scientific and Industrial Research Council of Alberta in 1921 as Chief Research Engineer and Honorary Secretary of the newly-formed Council. He remained in this position until his retirement in 1946. He was a member of the Faculty in the Department of Industrial Research for 25 years. His work with the Council, where his research in coal became known nationally and internationally, confirmed the vast resources of coal located in the province. His scientific work was described in some 50 publications and made a substantial contribution to the prestige of the University, the Faculty and the Research Council.

Professor Stansfield was an early member and supporter of the Association of Professional Engineers, a member of the Canadian Institute of Mining and Metallurgy, the Engineering Institute of Canada, and the Society of Chemical Industry. He was the Canadian representative for, and presented a paper to, the 1928 World Power Conference in London. He was awarded the Plummer Medal of the EIC in 1937. At the One Hundredth Anniversary celebrations of Confederation, Stansfield was awarded the Centennial Medal in recognition of his valuable service to the nation. Professor Stansfield died in Vancouver in 1970.

Clark and Stansfield were remarkable men who pioneered much of the industrial expansion of Alberta's vast resources and, while doing so directed many of the master's theses of the graduate students in Applied Science. Among the first master's theses in Applied Science were the "Preliminary Investigation of Weathering of Alberta Coals" - R.T. Hollies, 1921 and "An Investigation of the Bitumen Constituent of the Bituminous Sands of Northern Alberta" - S.M. Blair, 1924. This research has led to projects providing work for thousands of people and clearly demonstrates the value of fundamental research.

Chapter 5

The Post-War Era

Enrolment rose rapidly the first three years of the postwar era. The University was the fifth largest in the country with an enrolment of over 1100. Administrative pressures mounted on President Tory and he stepped down as Chairman of the Faculty Council of Applied Science and recommended the appointment of Dr. R.W. (Billy) Boyle as Dean.

The records show that Dean Boyle occupied the chair with eighteen professors in attendance in October 10, 1921 and immediately upon their assembly Sheldon expressed the satisfaction of the Council at the new appointment made by the Board of Governors. Dean Boyle thanked his colleagues on Council in the usual manner. It was back to business again but this time with an electrical engineer as Dean of the Faculty.

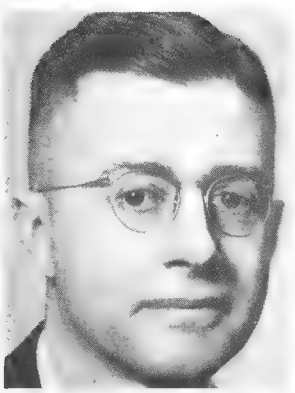
Max Fife, the first engineering graduate from the University to be appointed to the staff, resigned in 1922 to continue his formal education at MIT. His replacement was a young Edmonton native, Harry Randall Webb. Webb attended Victoria High School and received his degree in civil engineering in 1921 with great distinction, winning the John A. McDougall gold medal.

The following year, Webb obtained his Master's degree and was appointed to the staff of the Department of Civil Engineering as a lecturer and held increasingly important positions until his death, as a result of an accident, on the Labour Day weekend of 1942.

While at the University, Harry Webb was responsible for the junior and senior courses in hydraulics, water supply, sanitary engineering, hydrology, and concrete materials. His lectures were always carefully prepared and enthusiastically delivered with the class at full attention; to be otherwise, courted disaster. He was a no-nonsense professor, remembered by most as the efficient director of survey school. Those exciting days were a far cry from the mollycoddling of the students of today. This was the heyday of surcharges; tuition fees covered only tuition. Charges were made against prepaid "caution money" for damages and breakages of any sort. Webb made a killing during survey school, and the students learned to be responsible for equipment. It was a valuable lesson which remained with those who graduated. They never forgot the $5.00 charge for the first break in a steel chain (it cost Webb 25 cents to repair it). There was a decreasing charge for each subsequent break, so, older chains were in much demand. Axe handles, pickets, chaining pins, tapes and other necessary paraphernalia all had a damage price listed on the bulletin board. The students learned the value of equipment; larger items, such as levels and transits had negotiated prices. One reported major damage to Professor

Webb, and he pronounced the charge.

One summer afternoon a dejected student stopped at his desk to report an accident. "Sir," he said, "as I lifted up the transit to carry it to the next station the head fell off the tripod." Webb quickly looked at the damaged instrument, pronounced the spindle bent, and assessed the damage at $150.00 cash on the barrel and no writing the CE5 final exam until it was paid. What to do? No one had that much money. The student handed Webb a cheque for $150.00 on the morning of the examination. But during the exam a petition was circulated requesting the cost be shared by the entire class and it was signed by everyone present. The petition was presented to Webb at the end of the exam. Webb accepted the petition and returned the cheque but not before admonishing the student to henceforth be more careful. Despite his no-nonsense exterior, Harry Webb was a man of highest character, fine taste, tremendous ability, and boundless energy, who gave himself without stint to his students, his colleagues and his profession.



H.R. Webb

Webb carried on a consulting practice for many years outside the University and took a leading part in important engineering projects in Canada and the western United States. Webb was the resident engineer in charge of construction of the Minnewanka Dam just outside Banff. He was working on the construction of an impounding reservoir at Lake Kananaskis, and had been investigating streams for the potential water supply when he met his death. This work was part of his Ph.D. thesis and became an integral part of his lectures, which were alive with practical examples. Webb led the third and fourth year classes on field trips to construction sites such as the Grand Coulee Dam every second year. Webb devoted time and energy to his profession. He was registrar of the Association of Professional Engineers for the three years preceding his death and had been President of the Edmonton Branch of the Engineering Institute of Canada. His students will recall his profound belief in his profession and his informal talks on professional ethics which were exemplified in his own career.

At the time of his death, he was gathering meteorological and related data for the Ph.D. thesis he was completing at the University of Iowa. His students and colleagues marvelled at the neatness that characterized the graphical detail portraying the data. His work was superb. In the late summer of 1942 after a wait of several weeks, Webb, along with a young provincial forest ranger Bruce Broderick, a civil engineering instructor at the University Fred McPherson, and an engineering student Allistair Ross, decided to make the climb that ended so disastrously. It was Harry's intention to get high enough on Mount Sarrail, one of the "French group" to get a full bodied view of Mount Foch, another valuable water source for the Kananaskis Dam. This is the reason the party climbed the face of the mountain, instead of going up the back, which was the usual route for climbers.

Harry Webb had many flattering offers from industrial firms, but he preferred university life. He had broad interests and intellectual gifts. Harry was an excellent photographer. He combined the hobby of photography with his love of mountain climbing and several of his photographs of the mountains had won prizes. He was a talented musician who shared his love of music with two daughters. Webb was one of the group of young professors upon whom the University relied for its future leadership in educational matters. His character made him an inspiration to his colleagues and students. His untimely death at the age of 42 was an irreparable loss to the University and especially the Faculty.

When the Faculty engaged Lawrence Howard Nicols to teach physics in 1922,

they hired a gifted musician who contributed his musicianship to the community and to the University. After a distinguished service record in World War I, Lawrence Howard Nichols graduated from McGill and joined the physics department at the University. He gave devoted service to the University for over 30 years. He entered whole-heartedly into teaching and was especially successful with first year students. The engineering students were not inspired by his lectures in Physics 21 but they were amazed at his ability to play "chopsticks" by dropping different sized pieces of wood on the desk top or by klonking the tops of partially filled bottles. The results of one of his efforts to teach Physics 46, electricity and magnetism, were disastrous and to encourage and comfort the class, he offered a fifty dollar prize (a lot of money in 1940) for the top mark and a 40 ounce bottle for the bottom.

Music was his consuming interest. Nichols was a gifted and well-trained musician. He encouraged, trained and conducted student choral groups at a time when the University lacked such activities. In the city, he was well known as the organist and choirmaster of Knox Church.

When the University installed the War Memorial Organ in 1923, Nichols cooperated with Casavant Frères of Ste.-Hyacinthe, Quebec, in preparing the specifications. Nichols wrote the specifications when the organ was enlarged to make it a worthy memorial to those who had perished in the two Great Wars. He was given a supplementary appointment as University Organist in 1923, a post he held with distinction, until retirement. He provided the music on official occasions, such as Convocation, Sunday services and Remembrance Day ceremonies, and he gave a renowned series of Sunday afternoon recitals. Students from those early days will recall, with gratitude, his short informal recitals given late each afternoon during the final examinations period as a welcome relief from stress.

Professor Nichols at Console of Memorial Organ (1930).

In 1927, with the advent of CKUA the University radio station, it became possible to share the memorial organ with the public. The organ has faded away but the facade remains as a constant reminder of Nichols' love of music and as a tribute to those who served in World War I and World War II.

Professor Nichols retired to Hinton, and then to Knowlton, Quebec. He died in September, 1971, in the military hospital in St. Anne-de-Bellevue at the age of 80.

Enrolment in Applied Science broke the 100 mark in 1922-23 and in that year a third appointment to the Department of Geology was made. This appointee was to have a powerful influence on the practice of engineering and the development of the petroleum industry in the province.

R.L. Rutherford

Ralph Leslie Rutherford, affectionately known to his students as Highpockets, or Ralph the Rover, was born in Ontario and moved to Edmonton in 1907 at the age of thirteen. He attended Victoria High School and then entered the University of Alberta. He served in World War I; then he returned to the University where he was awarded his Bachelor of Science degree in 1919 and his Master of Science in Geology in 1920. Rutherford attended MIT for one year and then transferred to the University of Wisconsin and obtained his Ph.D. in 1923. Rutherford joined the geology department as a lecturer the same year and became a Professor in 1950.

His first job was in 1917 as an assistant in field survey work. He worked continuously in various parts of Alberta during the field seasons. He was field geologist with SIRCA, now the Alberta Research Council, from 1920-23. His subsurface geology of the foothills belt, especially from the Bow to the Peace River, contributed to the exploration and development of petroleum deposits in the foothills and under the plains in Alberta and Saskatchewan. His consuming interest in subsurface geology made him one of Alberta's foremost petroleum geologists. The demands on his services were a detriment to his health.

Ralph Rutherford cooking a meal on gas flare at Victoria (Pakan) September 25, 1917.

Rutherford, like Allan and Warren, stressed the professional aspects of geology and was a strong supporter of the Association of Professional Engineers of Alberta. He was made a Fellow of the Royal Society of Canada in recognition of his scientific accomplishments and was a member of the Geological Society of America, the Geological Association of Canada, the American Mineralogical Society, the American Association of Petroleum Geologists and played an active part in the Petroleum

Division of the CIMM. Rutherford was appointed Alberta's representative to the National Advisory Committee on Research in Geological Science and had just returned from a hurried but strenuous trip to a meeting of this committee in Ottawa a day or two prior to his death.

Rutherford was an excellent teacher who demanded high standards of his students. He believed in stressing the underlying principles of his subjects, primarily mineralogy and petrology in its wider application. He had a booming voice and colorful personality and his interest in the welfare of his students in geology and mining engineering endeared him to them. His influence on those who came under his direction has been long lasting. Shortly after leaving a group of his students in a mineralogy lab, he died of a heart attack. His oft expressed wish, to remain in harness to the end, had been granted.

Chapter 6

The Halcyon Days

In the mid-twenties, the Faculty entered its halcyon days. There were four well-defined departments; Civil, Electrical, Mining and Architectural plus a committee to guide a few students through a program in engineering physics. Occasionally, discussions were held regarding the introduction of chemical and mechanical engineering to the program.

The resources of the two new provinces, Alberta and Saskatchewan, were modest and the populations were small. It was deemed uneconomical to provide an education in all branches of engineering. Arrangements were made between the two fledgling universities to meet the needs of both provinces. Electrical engineering would be given at Alberta and mechanical engineering at Saskatchewan; the first two years could be spent at either school. This arrangement remained in effect until 1948 in Saskatchewan and 1959 in Alberta.

Students wishing to take chemical engineering had to take the honours chemistry program followed by a year of engineering courses but no distinct degree was offered. Dr. O.J. Walker and Dr. J.W. Shipley of the Department of Chemistry supported the establishment of a Department of Chemical Engineering. A committee on chemical engineering was established in 1926 to guide the programs of students working for a degree in chemical engineering. The first degree in chemical engineering at the University was granted in 1928.

E.H. Boomer

Dr. E.H. Boomer joined the Department of Chemistry in 1925 and for the next 20 years, until his death in 1945, he was a driving force in the department. Dr. Boomer was born in Vancouver in 1900. He was one of the first graduates (1920) in chemical engineering from the University of British Columbia. He studied physical chemistry at McGill, obtaining his M.Sc. in 1921 and his Ph.D. in 1923. The National Research Council granted him the Ramsay Memorial Fellowship which allowed him to study at Cambridge University under Lord Rutherford. He joined the staff of the Department of Chemistry as a lecturer in 1925 and was appointed Professor of Physical Chemistry and Chemical Engineering in 1943.

In his early years at the University of Alberta, Boomer was responsible for the teaching of physical chemistry. With additions to staff and the increasing importance of his research, his teaching duties were confined to advanced physical chemistry, thermodynamics and colloid chemistry. In later years, with the growth of chemical engineering at the University, he served as Chairman of the Committee on Chemical Engineering and was scheduled to be the first head of this department as soon as the necessary space became available.

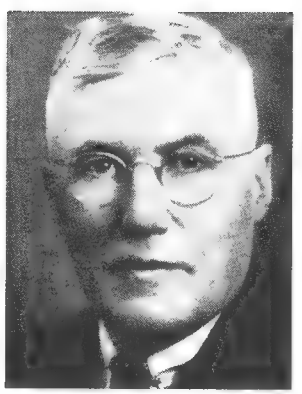
Dr. Boomer saw the possibilities of chemical research in connection with

provincial resources such as petroleum, natural gas, bituminous sands and coal, and initiated research dealing with their fundamental properties and improvements in their use. He studied catalytic hydrogenation of coal and tar sand bitumen and the oxidation of natural gas components at high temperature and pressure. Boomer investigated the decomposition of natural gas into carbon monoxide and hydrogen and initiated a study on the union of these compounds with suitable catalysts in the formation of liquid fuels. His studies of hydrocarbon phase equilibria were of considerable importance to oil producers in the province.

His reputation as an authority on processes at high temperatures and pressures spread throughout Canada and his advice was sought by many individuals and companies. He received tempting offers from industry, but refused them, because of his preference for university work.

Boomer was successful in training young scientists as research workers and generally had three or four of them occupied with his many problems. Their careers in industry were greatly enriched by their time spent in his laboratories. Over 20 of these men, imbued with his enthusiasm, went on to eminent careers in both government and industrial research laboratories.

In 1940, Boomer accepted a part-time appointment as western Canada's advisor to the Allied War Supplies Corporation. He spent part of his time in the design, construction and operation of ammonia plants for Alberta Nitrogen Products in Calgary and the Consolidated Mining and Smelting Company in Trail, B.C. In addition, he spent many hours each week directing research projects for the Directorate of Chemical Warfare and Smoke. He made infrequent trips to Ottawa as an advisor in atomic energy research. By 1943, the chemical plants under his supervision were operating smoothly and producing more than their rated capacity. Boomer asked to be relieved of his wartime duties in order to accept the chairmanship of the Alberta Oil and Gas Conservation Board and to become a member of the provincial Natural Gas Utilities Board. The boards utilized his experience in the efficient recovery of petroleum from producing wells and in cutting the wastage of natural gas. He was a consultant to the provincial government in both chemical engineering and chemistry.



J.W. Shipley

Boomer joined a British government target team in British Occupied Germany to study the conditions of the synthetic fuel industry. He served as scientific adviser to several Alberta government commissions investigating disasters in coal mines. He was sought as an expert witness because his evidence in court was clear and convincing.

Boomer was elected a Fellow of the Royal Society of Canada in 1936, and a Fellow of the Chemical Institute of Canada. He was a member of the Association of Professional Engineers of Alberta, a member of the Edmonton Kinsmen Club and the Mayfair Golf and Country Club. He was an avid hunter and sportsman. Ed Boomer enjoyed the friendship of people from coast to coast. He died in his sleep following a heart attack at the age of 45.

When Stan Morgan left for graduate work, he was replaced by W.E. Cornish. Wilf Cornish was born in Broadview, Saskatchewan in 1901, with a slide rule in one hand and a portable voltmeter in the other. He graduated from the University of Manitoba, in 1923, with a B.Sc. in electrical engineering. His first job was designing substations for the Winnipeg Electrical Company. He worked for a year at the University of Manitoba as a laboratory demonstrator in electrical engineering before obtaining a position with Canadian General Electric in Peterborough, Ontario,

where he worked in the test line at C.G.E. testing motors, generators and appliances. Late in 1927, Wilf Cornish joined the Department of Electrical Engineering as a lecturer.

W.L. Cornish

Cornish obtained his M.Sc. from the University in 1933. He did this while attending his regular tasks of lectures and labs. During the summer months, he rebuilt and improved the old CKUA transmitter. In 1938, he and Ward Porteous planned to attend the University of Michigan to obtain their Ph.D.'s. The outbreak of war in 1939 changed their plans and they did not complete their graduate studies.

In 1940, Cornish went to Montreal to work for the Aluminum Company of Canada. He designed the rectifier layout, bus-bars and switch gear for the rectifier building of the Arvida aluminum plant; the Arvida plant had the largest battery of mercury arc rectifiers in the world. The output of the two Arvida plants was 800,000 horsepower, which was more power than used by the City of Montreal in 1940. Cornish designed bus-bars carrying 60,000 amperes of current; they were placed so that their electric fields did not interact. The design was completed in July and when Cornish supervised the installation of the equipment he found rotary converters in the original plant that he had tested in 1926, while with CGE.

Cornish was an excellent lecturer, well-liked and admired by his students. The students responded to his willingness to give advice or lend a helping hand. They voted him their honorary president in 1930 and again in 1939. Cornish was devoted to his profession, he served as chairman of the Edmonton branch of the Engineering Institute, on the Council of the Association of Professional Engineers of Alberta and was elected President in 1941. He held this post at the time of his death, February 1942.

During the 1928-1929 session, Carson Morrison (M.A. McGill) served as a sessional lecturer in civil engineering and mathematics. He resigned the following year to accept a position in the Department of Civil Engineering at the University of Toronto where he served as department head from 1954 to 1968. He was an eminent professor of structural engineering and an internationally respected consulting engineer. Now in his eighties, he continues to serve his firm, Morrison, Hershfield, Limited as Chairman of the Board.

Registration at the University and the Faculty of Applied Science increased steadily. The 1928-1929 session saw a total registration of 1,516, with 208 engineering students or 14 per cent of the student population. Engineering students remained at 15-16 per cent of the student population for over 25 years, until the infamous *Academic Plan Number 8* fixed the number at less than l0 per cent. This was a bitter pill for the Faculty.

The restraint imposed by the great Depression was not, as yet, in evidence at the University. Several staff appointments were made, including Professor Ernest Sydney (call me Frank) Keeping.

Frank Keeping was born in England in 1896, and was educated in educational institutions in Britain. He completed his formal studies at Imperial College, London. He served with the Royal Engineers from 1917 to 1922. His academic life spanned more than half a century; the first seven years were spent at the University of Wales. In 1929, he accepted a position as assistant professor with the Department of Mathematics, and became the fourth full-time instructor. Keeping had a strong background in theoretical physics and taught courses in mechanics, tensor calculus, advanced mathematics for engineers, wave mechanics, statistical mechanics and assisted Professor Sheldon with the courses in statistics.

E.S. Keeping

Engineering students were first introduced to Keeping in the mechanics courses. His love of mathematics made him a superb teacher. Students did not question the relevance of the material that formed the basis of his math courses. His manner of speech resembled a lisp; it often caused remarks such as "that is no lisp, he's just sucking in another integral." His students could recall significant ideas presented to them in his classes. People who use the Hewlett-Packard hand calculators can thank him for the method of operation. Two of his students who were associated with the development of the hand calculator remembered Keeping's teaching of reverse Polish logic and incorporated this teaching into the design. Former students who visited him received a warm welcome and an abiding interest in their careers.

Keeping was closely associated with engineering throughout his career at the University and devoted a significant portion of it to the Committee on Engineering Physics. He worked with Morrison for many years to establish and maintain the

Mathematics-Back row: M. Wyman, E.W. Sheldon, J.W. Campbell Front row: A.J. Cook, E.S. Keeping.

standards of the program and became Chairman when Morrison retired. His major interest was in the field of statistics. He was considered a world authority and his three books on statistics are definitive works in the areas they cover. He served as Head of the Department of Mathematics from 1954 until his retirement, in 1961. Once, while giving a lecture to the Science Association, Keeping said that if all the molecules or atoms that made up the universe were added together, the sum would be an odd number. Professor Morrison was heard to whisper "Well, he has a 50-50 chance of being correct."

After his retirement from Alberta he taught statistics for a year at the University of North Carolina. His services to the University were recognized in 1972, when he was awarded an honorary doctorate of law. Keeping was a very active Emeritus Professor working until his death at the age of 88.

There is a renegade, of sorts, in every class. Edward Hunter (Ted) Gowan was one. He was at home with the arts as well as with the sciences. This trait remained with him throughout his life. Ted Gowan was born in Montreal and moved to

Suicide slide, 1939

Edmonton when his father was appointed manager of Credit Foncier. He was educated at Oliver and Victoria High Schools. Gowan was the first premier of the Alberta Tuxis Boys Parliament. He enrolled in the combined B.A./B.Sc. course in Applied Science. He enjoyed every minute of his undergraduate days. The 1924-25 "Evergreen and Gold" carries a brief sketch of the first engineer to win a Rhodes Scholarship.

> A smile that won't come off and a hearty disposition marks this man wherever he goes. A naturally scientific mind trained by diligent study has resulted in an enviable scholastic record during his University career. His student activities included: President of the Senior year, 1923, President of the Dramatic Society; Director of the Senior Play in 1924 and Delegate to the SCM conference at Toronto in 1922. Ted has been an active participant in such outdoor sports as skating, tobogganing on Suicide Slide, hiking, swimming and playing tennis. Since Ted is the first student in physical (sic) engineering to win the Rhodes Scholarship, his career at Oxford will be watched with the greatest of interest by all. Without doubt a brilliant future awaits him.

This tribute is correct in all but one aspect, Ted graduated not in physical engineering; that degree did not exist. He was the second student to graduate in engineering physics, a tailor-made program for brilliant engineering students who want to acquire an intensive theoretical background that will prepare the way for graduate work. Ted Gowan graduated with first class general standing. A very real achievement!

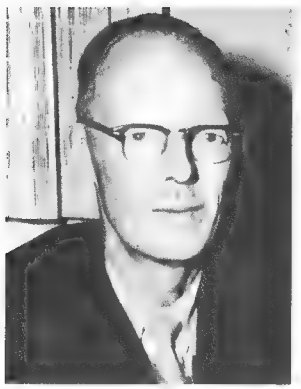
E.H. Gowan

Gowan graduated from Oxford in 1929 with his Ph.D. in meteorology and joined the staff of the physics department, as lecturer. He taught physics to second year engineering students for nearly 30 years. His rapid-fire style of lecturing kept students on their toes in his classes on electricity and magnetism (Physics 46). Graduates in electrical engineering will remember their senior course in Physics.

Although Gowan taught several courses relating to electricity and magnetism, his research interest was in the meteorology of the upper atmosphere. He carried out research work on the measurement of ozone, ultraviolet light and stratosphere temperatures. Gowan wrote a great many scientific papers in his field and the calibre of his research brought international recognition to him and to the University. He served on a number of international commissions for the World Meteorological Organization. His research in solar radiation was recognized in 1950, when he was elected a Fellow of the Royal Meteorological Society.

Ted Gowan served as the Marshal of the Convocation Procession for many years. In 1933 he married the well-known playwright Elsie Park, thus cementing his relationship with the arts. He was active in the life of the University and took a special interest in the drama society. After a long, lingering illness he died at the age of 57.

Twenty years after his installation as President of the University, Dr. Tory was ready for new conquests. In 1929, he left to become Director and then first President of the National Research Council. He took Boyle who became Director of the Division of Physics and Electrical Engineering. R.S.L. (Bob) Wilson succeeded Boyle. Two of Wilson's early appointments were John Wardlaw Porteous and Robert MacDonald Hardy.

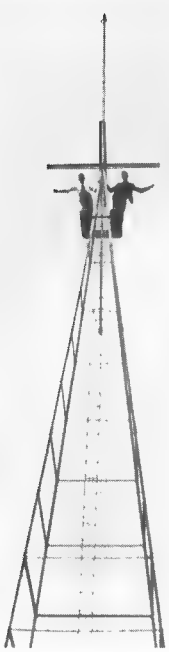


J.W. Porteous

Ward Porteous was born in Galt, Ontario in 1907, and came to Edmonton at an early age. He was educated at the King Edward School and Strathcona High School. He completed high school at the age of fifteen, but could not enter the University until he was sixteen. He worked as a "lab boy" in the physics department for a year and there his interest in the newly emerging field of radio and electronic communication was established.

Porteous enrolled in the Faculty of Applied Science in 1924 and graduated four years later with his bachelor's degree in Electrical Engineering. He worked for Canadian Westinghouse for two years following graduation and then enrolled in graduate study at Smith College of Applied Science at Syracuse University. In September 1930, he accepted an offer from Hector MacLeod to return to Alberta as an instructor in the department of Electrical Engineering. In 1932, on the basis of his graduate work at Syracuse and Alberta, he was awarded his master's degree. In 1938, he and Wilf Cornish were granted leave to pursue their doctoral studies at the University of Michigan. The outbreak of World War II required them to return to their teaching duties, and the opportunity did not recur.

Porteous was promoted to Associate Professor in 1944 and to acting head of the department in 1945, a post he held until 1947. During his tenure as head, two distinct options in the Department of Electrical Engineering were introduced: power, and electronics and communications. Electronics and communications were Ward's major responsibilities during his tenure at the University. He was a pioneer in the field of radio and its use in education for Canadians. He helped to construct the original CKUA on campus and chose the frequency 580 kHz so that it would reach to all points in the province. This allowed the broadcasts from the Department of Extension to reach the outlying areas. In 1939, he undertook the design and installation of the expanded CKUA facility north of Ellerslie. The operation of CKUA was taken over by Alberta Government Telephones in 1945. It continued as a major research facility for the department for another decade. Porteous was a full-time instructor of electronics for the armed forces during World War II. Following the war, he spent a summer on classified research with the antenna section of the National Research Council.



CKUA Tower

Ward's academic interests were in teaching and the welfare of students. He devoted much of his free time as an advisor to numerous student organizations and he served for many years on the University Athletic Board. In the late 1940's he became the Faculty's representative on the Athlone Fellowships, a program funded by British industry. It provided two year scholarships to either British universities or research establishments, or two years in British industries or a combination of the two. The participants would become acquainted with British products and more readily prescribe them in their professional careers. The scheme worked well for some 20 years and came to a close in 1970.

Professionally, he was an active member of the Edmonton Branch of the Engineering Institute of Canada and served a term as Chairman. He organized a student chapter of the Institute of Radio Engineers as well as a local branch of the Institute. Later, the name was changed to the Institute of Electrical and Electronic Engineers (IEEE). Ward Porteous was associated with the University for over 40 years, first as a student and then as a devoted and conscientious professor who will always be remembered as one of the founders of CKUA.

Wilson's second appointment, in September, 1930, was Bob Hardy. Bob Hardy led the Faculty to a position of eminence in Canada. During his 21 years as Dean

of Engineering at the University, he made outstanding contributions to engineering education, both in Canada and the United States. He served his profession and its associated technical bodies with distinction. As an enthusiastic researcher, he dominated his chosen field of soil mechanics. Bob Hardy developed an outstanding graduate school in this discipline and brought recognition to the Faculty. His students serve as staff members at fifteen universities on this continent, and others operate their own consulting firms throughout the world. He was recognized, not only as Dean of Engineering at the University of Alberta, but as the Dean of the entire Canadian engineering fraternity. No greater recognition could be accorded to an outstanding practitioner.

R.M. Hardy Dean of Engineering, 1946-1959, 1963-1971

Hardy graduated as the gold medalist in civil engineering from the University of Manitoba in 1929. He received his M.Sc. in civil engineering from McGill University in 1930 under the John Bensell Porter Scholarship. He continued graduate studies at the University of Michigan, during the summers of 1933 and 1934, where he studied applied mechanics under Professor Timoshenko. During the summers of 1935-1938, he articled and qualified as a Dominion Land Surveyor and as a registered surveyor in Alberta, Saskatchewan and British Columbia.

During the late 1930's, his colleague, Professor I.F. Morrison, interested him in the newly emerging field of soil mechanics as conceived by Dr. K. Terzaghi. He took his only sabbatical leave in 1939 and 1940 to attend a graduate program in soil mechanics and foundation engineering at Harvard University.

Hardy was awarded a D.Sc. (Honorary) from the University of Manitoba in 1957 in recognition of his work in the field of soil mechanics and foundation engineering. In 1972, his second D.Sc. (Honorary) was received from the Royal Military College of Canada in recognition of his achievements in teaching and the practice of engineering. The University of Alberta awarded Hardy the honorary degree of Doctor of Laws in recognition of his outstanding contribution to the University and to the Province in 1977.

Hardy joined the Faculty of Engineering as a sessional lecturer in September, 1930. In 1946, he was appointed Professor, Head of the Department of Civil Engineering and Dean of the Faculty. In May, 1959, he resigned from the University to devote full-time to his expanding consulting practice. He retained a part-time research professorship in civil engineering. In September, 1963, he was reappointed Dean and held this position until his retirement in 1971.

While Head of the Department of Civil Engineering, he developed the largest school of graduate work in civil engineering in Canada. His reputation as a researcher and practitioner in the field of soil mechanics and foundations attracted large numbers of students from every province in Canada and from many countries abroad.

Hardy served in the armed services, first as a Captain in the engineers, then as a Squadron Leader in the Air Force. His dry lectures in navigation drove many to the real thing, and he was affectionately referred to as "Fighting Bob the Desk Pilot." The younger members of the staff found him to be a shy, retiring man, difficult to know, but those who made the effort found him to be a true friend and wise counsellor.

As Dean, he brought a new dimension to educational administration. Committees could decide everything provided he agreed with them. He retained the power to change and to veto. As chairman of hundreds of committees, he could hold out and starve people into submission. He was an expert at interpreting the meaning

of a motion and exercised an elastic imagination in having the motion say what he wanted. His mastery of committee control was superb.

During this time, he carried out an active consulting practice in soil mechanics. He consulted for all the Canadian airports from Newfoundland to Vancouver Island, the Alaska Highway, and the provincial highways (his paper "the road to hell is paved with good intentions" struck home). The Kitimat and Kemano projects and earth dams were all his meat and drink. If you wished to talk with him, you had to drive him to the airport. That was the only time you could corner him.

After Dean Wilson retired, Hardy assumed responsibility for the veterans on campus. He did everything but write their examinations for them. In some cases they did not write examinations. He could find devious ways of granting them a pass, and they loved him for it. The pressure on Hardy was immense and people close to him began to recognize the danger signs. Like a rattler, he warned before he struck! He would march down the corridor snapping his fingers, one snap a second - sunny disposition, hit him up for a raise - or some new equipment; five a second - not a good mood; ten a second - beware! stay out of sight. With no equipment, except what he built or had built, no space, and a small staff, he guided the largest classes in our young history through to graduation.

It was a privilege to work with Bob Hardy. He applied his amazing organizational skills to the deanship. Staff members had the opportunity to experience his ability in working efficiency. Hardy organized untrained technicians to carry out routine tests and produce data which he meticulously plotted, studied, then drew conclusions and completed the design. His colleagues considered his ability to use the results of tests produced by untrained personnel as one of his outstanding achievements. Hardy could talk to a staff member, plot a graph, read an article, answer the telephone, write a letter, and effectively deal with the problem at hand all at one time. His reputation for fairness extended to the ethical issues of the profession. It is said he once acted as consultant to both parties in a legal dispute, explained the problem and gave an impartial decision.

Hardy was adept at hedging and could postpone a decision or a request until it was as he wished. His motto seemed to be "Wait a wee minute - it will go away." He feared no man, but was deathly shy of women, and young wives rode roughshod over him. He couldn't say "no" to them. Many a failed student was re-enrolled because "he was under new management" and the young wife and the student never let him down.

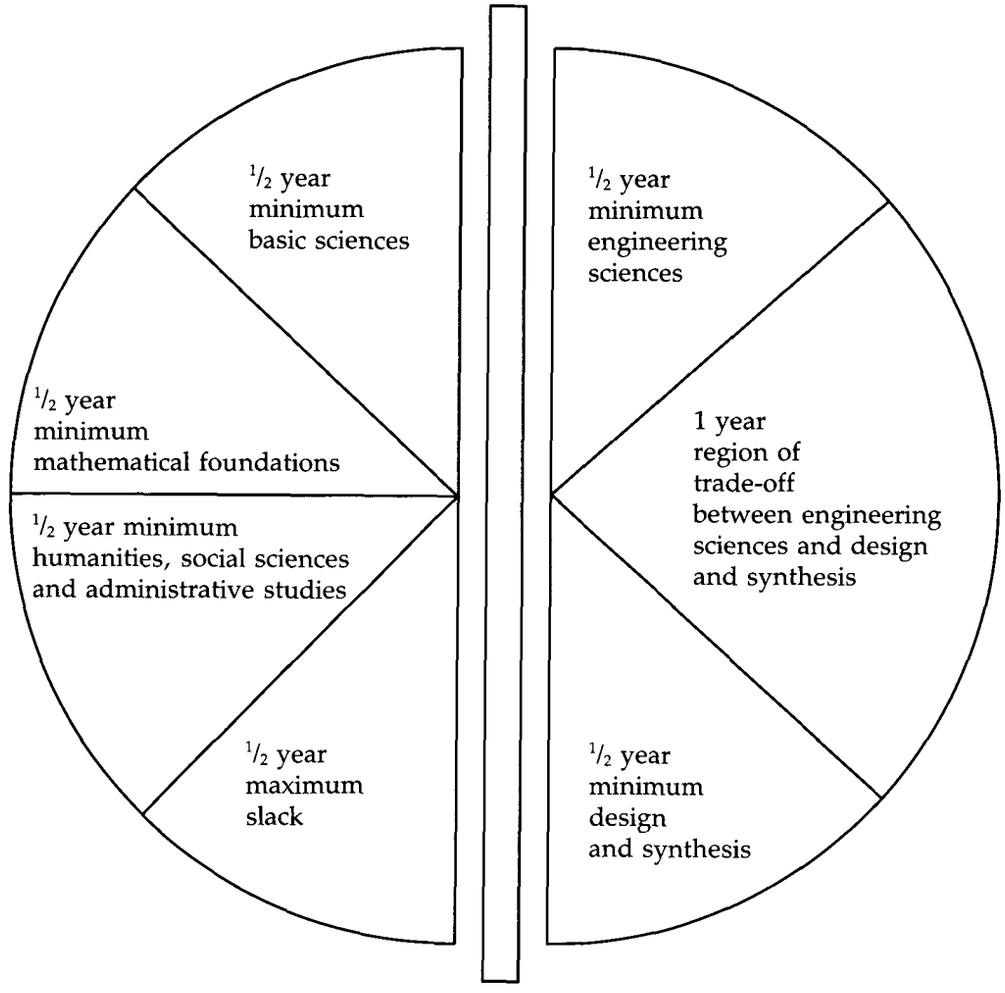
Hardy was an inveterate collector; he never threw anything away - he filed it away for future use. This paid off! In his first years on campus, the pay was low, and true to his Scottish traits, he kept a graph of his income versus his expenditures. In the late sixties he used these graphs to successfully establish his pension rights. He was a devoted follower of General McArthur and loved to paraphrase him: "Old Deans never die, they simply lose their faculties." When he retired in 1959, he was heard to say as he received his retirement gift "I will return" and by God, he did!

Apart from his scientific and administrative duties at the University, Hardy was deeply involved in the overall development of engineering education on this continent. He was a member of the American Society of Engineering Education and contributed several papers on the philosophy of engineering education and served on a number of their committees. He was an active contributor to the extension activities of the University and during the decade 1946-56, was responsible for four refresher courses in foundations, highway and airfield design. The Canadian

Accreditation Board, first formed in 1969, drew on his experience in setting out the criteria required of every engineering program given at a Canadian university. His research capabilities coupled with his practical solutions led to his appointment to the Division of Building Research Advisory Committee of the National Research Council of Canada.

Hardy joined the Association of Professional Engineers of Alberta when he arrived here in 1930. He served as a member of council, 1947-48, as Vice-President, 1948-49, and as President in 1949-50. He was chosen the Association's representative to the Canadian Council of Professional Engineers for the period 1951-55;

Interpretation of CAB Criteria



Two-year minimum of Engineering Sciences and Design and Synthesis

serving as Vice-President, 1951-52, and as President, 1952-53. Hardy actively participated in the Engineering Institute of Canada. He served as Chairman of the Edmonton Branch, the Vice-President of the Institute, Chairman of the Civil Division of the Committee of Technical Operations, and as a member of a task force which produced the report "A Canadian Policy for Research and Development." He was a force in the development of the Canadian Good Roads Association, having served as a member of the Advisory Committee on Technical Information, Chairman of the Scholarship Awards Committee, Chairman of the Soils and Materials Committee, Director and Member of the Operating Committee. He served as Chairman of the Pilot Study Committee on Highway Research in Canada which formulated the policy for the development of highway research in this country. He served his profession as Vice-President for western Canada on the Canadian Committee of the International Congress on Large Dams and represented them on several international visits.

Hardy believed that it was essential for an educator in a professional faculty to participate in the practice of that profession. He was eminently successful in his professional practice. Hardy was a specialist in the application of geotechnical concepts to engineering problems throughout Canada and the Canadian Arctic. The

Bob Hardy and Walter Lilge surveying gold mining claims Lake Athabaska, 1935.

solution of these problems brought him international acclaim. He was Chairman of the Board of Directors of R.M. Hardy & Associates Ltd.

Hardy was aware of research within the academic domain and the vital role it played in the advancement of engineering. During the 30 years that followed his studies at Harvard, he supervised the research efforts of over 40 graduate students. Additionally, he conducted basic and applied research in connection with permafrost, the engineering properties of muskeg, frost action in soils, strength properties of varved clays, fundamental strength properties of overconsolidated clay shales, and the stability characteristics of tar sands. The results of his studies have had extremely wide applications, resulting in substantial economic savings on major construction projects in Canada. Dr. Hardy served on many committees and subcommittees of the National Research Council. He served as a member of the Alberta Research Council and for many years he was Chairman of the Advisory Committee on Highway Research.

His professional reputation led to his appointment on the Borden Royal Commission for Energy in 1958. The Commission dealt with national policies concerning the export of natural gas and the markets for Canadian crude oil. The following year, he was appointed technical advisor to the Manning Royal Commission on the location of the Pine Point Railway.

His international reputation as an educator, researcher and engineering consultant has been recognized. He was elected a Fellow of the Royal Society of Canada and a Fellow of the Engineering Institute of Canada. He held a Life Membership in the American Society of Civil Engineers and in the Association of Professional Engineers, Geologists and Geophysicists of Alberta.

He has been awarded the Keefer Medal of the Engineering Institute of Canada (1947), the Centennial Medal of Canada (1967), the Centennial Award of the Association of Professional Engineers of Alberta (1968), the R.F. Leggett Award of Canadian Geotechnical Society (1971) and the Canadian Engineers Gold Medal for 1973 by the Canadian Council of Professional Engineers.

In September, 1971, Dean Hardy retired to private practice; he was active for six and often seven days a week. His health began to fail and he suffered several minor strokes. On October 2, 1985, he died at the age of 79.

In the report to the Board of Governors in 1930, President Wallace's remarks are being echoed by the present administration, as our Faculty enters its 75th anniversary.

> "In teaching buildings, no relief has been obtained since 1921, when the medical building was completed. Every available room is taxed to overcrowding. Convocation Hall has been made available for drafting work in the Applied Science course, and can be used for its own legitimate purposes only at great inconvenience. All the available space in St. Joseph's College (opened in 1927) has been rented for classroom purposes. Corridor space is used for laboratory work in accountancy. The library building asked for last year is an urgent necessity. Not only is the library much overcrowded and quite inadequate for the needs of the University as it now is, but relief will be obtained in the library building for the Extension Department, now very unsatisfactorily housed, and for the Applied Science courses, for which seven thousand square feet of floor space will be set in the library building temporarily for drafting room purposes. It is

unnecessary to elaborate a situation which is this critical.

An Applied Science building will be the next teaching building in the expansion of the University. The field of Applied Science offers great attraction to our students, and the greatly increased numbers are already a serious problem in laboratory accommodation, aside altogether from the question of drafting space, which has already been discussed."

Two years later, in 1932, conditions had deteriorated even further:

"The University budget has been very seriously reduced within the past two years. The vote from the Provincial Legislature was $588,388 for 1930-31; for the year 1933-34, it is $390,000, and that inclusive of the work of the Research Council, which hitherto had a vote independent of the University budget. On a comparative basis, the vote has been reduced from $588,388 to $375,000 in two years. This could be effected only at severe cost. No regular increments to salary of staff have been paid for three years. Two deductions have been made in salary as well during the period. Many members of the staff are now being paid $750 to $1,000 less than their normal salary would be at the present time. Vacancies have not been filled, and demonstrator assistance has been practically eliminated from the laboratories. Part-time members of staff in medicine, dentistry, law and education have taken very heavy reductions in honoraria. And all instructors have been called on to do more work because of the reduction in the amount of teaching assistance. Courses have been eliminated where there seemed to be a possibility of carrying on with a measure of efficiency without these courses. The outside services have been severely restructured - the work in Extension, the work of the provincial laboratory in health services, the work on the University grounds. Research work has suffered more severely than possibly any other field of University work, and for two reasons. The members of the staff have less time at their disposal for research, and young graduates of ability have not, now, opportunity of financial assistance by means of demonstratorships to encourage them to go forward to research work. It has been found necessary as well to increase student fees materially, though not out of proportion to those of other universities.

While in very many individual cases of staff and students this whole situation has caused real hardship, and while in all cases and in the University as a whole it has created real difficulty it has been possible to carry on without relinquishing any major field of University activity. There has been displayed a profound loyalty to the University during the difficult time, and this has made the path of those who have administrative responsibilities an easier one to tread. It must be frankly admitted, however, that it is not easy under the circumstances to maintain the morale which permits a University to do its finest and highest work and it is of grave importance that conditions as far as staff are concerned be made easier at the very earliest possible time. I wish to urge that the temporary deductions in salary be terminated and the opportunity be given to go forward with the salary schedule as adopted by the Board in 1929.

I have felt it to be my duty to make this statement on behalf of the University at the present time. It must not be inferred from the statement that the men and women of the University are not fully alive to the difficulty of the world situation. They have shown in many ways, and not least in the work carried on by the Alumni in the education of the unemployed, that they are taking on themselves real responsibilities in the economic distress of the present time. Nor can it be inferred that they are critical of any action that has been taken. But they are more fully alive than others can possibly be to the permanent value of the work which a University can do, and of the necessity of protecting and safeguarding the continuity of that work. Unlike many other fields of activity, it cannot be broken and later recovered without permanent loss. And a loss in the realm of the inner values in education, as education is interpreted in the best work of a University, is a loss incalculable and irreparable."

Despite the stringent curbs on expenditures, enrolment in the University rose from 1,824 to 2,327 in the decade 1930 to 1940, while enrolment in engineering oscillated between 260 in 1930 and 300 in 1940. No additional staff were hired, several sessional appointments were made to assist when staff were on leave: Jack Sexton in 1930, Les McManus from 1936 to 1940, and Dudley Menzies in 1940.

When Hector MacLeod resigned in 1936 to become Chairman of the Department of Mechanical and Electrical Engineering at U.B.C., his replacement was Professor Ernest Geoffrey Cullwick.

Professor Cullwick was born in Wolverhampton, England, in 1903. He was educated at Wolverhampton Grammar School and Cambridge University, entering Downing College in 1922 as a mathematics scholar. He gained first class honors in the Mathematical Tripos, Part 1 and was awarded a Foundation Scholarship from Downing College in 1924. He graduated in 1925, with a second class in the Mechanical Sciences Tripos.

Cullwick spent a year with British Thomson Houston Co. Ltd. before he accepted an appointment with the Canadian General Electric Co. in Ontario. His first academic appointment was in 1928 as Assistant Professor of Electrical Engineering at the University of British Columbia. He was appointed Associate Professor seven years later. In 1934-35, he lectured at the Military College of Science at Woolwich, England. Cullwick was appointed Professor and Head of the Department of Electrical Engineering at the University of Alberta in 1937.

Cullwick was rather reserved and his colleagues had difficulty getting to know him. In conversation, he had a habit of careful reflection before replying. These pauses would be somewhat unnerving to newcomers. Not given to outright laughter, but rather the smile and the chuckle, Professor Cullwick had a wry sense of humor. Stories circulated about his habit of spying on students while creeping about the laboratories. For this, he was irreverently referred to as "creeping–".

At the outbreak of World War II, he organized technical courses for electricians of the Royal Canadian Engineers and was appointed Director of Technical Courses for the R.C.A.F. and R.C.N. at the University. In 1942, Professor Cullwick was appointed Director of Electrical Engineering for the Royal Canadian Navy with the rank of Acting Commander and was instrumental in forming the "L" Branch of the R.C.N. He was promoted Acting Electrical Captain in 1945 and Captain (L) in 1946. On leaving the R.C.N., he was in charge of the Electrical Research Division of the

Defense Research Board in Ottawa. He became the first incumbent of the Watson-Watt Chair established by the Court of St. Andrews University in University College, Dundee, Scotland in 1949. He held this appointment, with distinction and increased influence, for 24 years.

Alan Cameron resigned to become Deputy Minister of Mines and Public Works in Nova Scotia in 1937. Karl Clark moved from the Department of Industrial Research to become Professor of Mining and Metallurgy. Changes were taking place and World War II would alter the size and the direction of the Faculty.

Chapter 7

A New Era Begins

In the early 1930's, University enrolment wavered around 2,000 while registration in the Faculty of Engineering averaged about 280. Employment opportunities were scarce. Many young engineering graduates worked wherever they could, often in jobs totally unrelated to their education. Mining engineering became popular for it was within this sphere of activity that jobs were the most plentiful. In this decade, one-third to one-half of the graduating classes in engineering were students of the mining department. From the soft rock areas of western Canada to the hard rock locations in Ontario and Quebec, engineers settled in and assumed increasing responsibilities for the development of Canada's mining industry.

Student enrolment increased during the thirties. The Department of Mining and Metallurgy hired Ewald Oscar (Walter) Lilge, a recent graduate, as an instructor. This was in 1935 and for the next 35 years he played a central role in the development of the department. Walter Lilge was born in 1906 in Bruderheim, Alberta, where he received his early education. He attended the Camrose Normal School during the 1924-25 session and received his first class teaching certificate in 1926 and taught school for three years. Lilge then enroled in the mining engineering program at the University, graduating in 1933. He was the first recipient of the Northern Alberta Branch of CIM student prize.

He worked at the Britannia Mine in British Columbia before joining the Faculty as an instructor. He obtained his M.Sc. in Mining Engineering (ore dressing option) during his first two years on staff. In 1944, he was appointed Assistant Professor, Associate Professor in 1948, Professor in 1949, and Head of the Department in 1954. Lilge's academic area of expertise was in ore dressing and mill design and his research activities related mainly to mineral dressing. He spent the summers, from 1935 to 1945, in the mining fields of western and northern Canada. He practiced as an exploration geologist, mill superintendent, research engineer with Consolidated Mining and Smelting and the Research Council of Alberta. He established an active consulting practice in 1945 in mill design and ore dressing.

The post-war years saw a surge of graduates through the department. Many entered the petroleum industry which was rapidly developing following the 1947 discovery of oil in the Leduc field. Metallurgy courses had been offered as part of the mining program since the 1920's, and in 1956 a formal degree program was initiated. The impetus for the program was the growth of metallurgical activities in the province with the opening of the Sherritt Gordon Nickel Refinery at Fort Saskatchewan in 1954, and Premier Steel in 1956.

Lilge recognized this newly developing area, and increased the strength of the

department by recruiting new staff. In 1955, Dr. J. Gordon Parr joined the department followed by Dr. J. Leja and Dr. W. Youdelis. Metallurgy flourished for some ten years, particularly at the graduate level, with Lilge and Leja in mineral processing and extractive metallurgy and Parr and Youdelis in physical metallurgy. The golden age of metallurgy at the University was marred by internal strife, which Lilge found difficult to overcome. In 1964-65 three of the leading metallurgists left and Lilge had the problem of recruiting new staff. In spite of this, Lilge kept the Department running and continued his research and professional activities.

E.O. Lilge

In 1959, he was awarded the Engineering Institute of Canada Leonard Gold Medal for a paper on the operation variables of the Driessen Cone and, in 1963, the Institute of Mining and Metallurgy (London, England) awarded him the Consolidated Gold Fields of South Africa Gold Medal for his paper on Hydrocyclone Fundamentals.

Lilge maintained his memberships in the Associations of Professional Engineers of Alberta, British Columbia and Saskatchewan. He was a member of the Canadian and American Institutes of Mining and Metallurgy, a member, Director and President of the Alberta and Northwest Chamber of Mines and an active member of the South Edmonton Rotary Club. On August 31, 1971, he retired to private practice and continues to live in his Windsor Park home.

Jimmy Adam retired in September 1938. He was one of the first appointments to the Faculty as Professor of Drawing and Descriptive Geometry. His successor, William Walford (Wally) Preston, was born in 1910 in Ontario. He matriculated from the Hamilton Technical High School in 1931 with the Steel Company of Canada Honor Matriculation Scholarship and graduated in civil engineering from Queen's University in 1935. He worked for a year as a surveyor's assistant after graduation and then joined the Hamilton Bridge Company as a structural steel detailer. He joined the Faculty as a lecturer in September 1938 and was appointed Associate Professor in April, 1950.

W.W. Preston

Wally was a specialist, taking very little interest in engineering subjects other than drafting and descriptive geometry. In some respects the Faculty was fortunate in having a member of staff willing to make a career in this area. He completely reorganized and modernized the drawing courses during the early forties, making them among the best in Canada. Unfortunately, his single-minded interest handicapped him in his professional contacts in the engineering profession.

He was meticulous in his work. He drafted and redrafted several versions of a textbook in descriptive geometry, but did not get it to the point where he thought it could be published. His meticulous demands often made him at odds with the students. Early in his career, Dean Wilson and Professor Morrison had to quell a sit-down strike in Drawing 6. Despite these difficulties, his presentation of the graphical solutions to engineering problems offered his students practical instruction in this field. Wally took early retirement, in 1973, after 35 years of service.

With the outbreak of World War II, Professor C.A. Robb took a leave of absence to act as a power consultant with the Department of Munitions and Supply. A retired professor of mechanical engineering from the University of Saskatchewan, Alexander Roger Greig agreed to fill in until a suitable replacement could be found. Professor Greig was well over retirement age when he took on this task. He was a very gentle, lovable man who became affectionately known as Coky Joe. It is sad to report that courses given at that time did not touch on modern thermodynamics. The first and second laws were never mentioned in any of the classes, but everyone

could run a heat balance on the boilers in the Power Plant. Religiously, Professor Greig, with his 30 inch spiral slide rule, corrected every report by changing the three figure calculations given by a regular slide rule to the four or five figures he could get on his slide rule. The students who attended during those two years learned more than they realized and did have the pleasure of meeting a charming little gentleman.

Professor Greig was succeeded by one of his former Saskatchewan students. Dr. Allan Hogg was a dynamic young man who obtained his Ph.D. at the University of Toronto in solid mechanics and vibrations. His interest in thermodynamics was minimal and after a short stay he left to join the research division of Ontario Hydro. Dean Wilson went to McGill to pluck out an Albertan, who had taken his first two years here, to succeed Dr. Hogg. In November of 1945, fresh from the Canadian Navy, came the "Little Admiral", E. Keith Cumming, to become the Captain Bligh of the South Lab, and five additional junior staff were added to assist with the heavy laboratory load. Thermodynamics sprang back to life; the first and second laws became the heart and soul of the undergraduate engineer. But Keith soon recognized the expanding opportunities of private practice. He resigned in 1948 to enter the business world and make his fortune. These days he can be seen in his counting house at Kanata Holdings Ltd.

E. Cummings

As the hungry thirties came to a close, registration in the Faculty climbed into the three hundreds. The basic engineering courses in the first two years of the program were given by the Department of Civil Engineering and so additional staff was required. Leroy Allan (Chick) Thorssen and Leonard E. Gads graduated in September 1939 and were added to the instructional staff. The following year George Wheeler Govier (genial George to many and because of his initials G.W.G., Iron-man pants to others) was added to the staff of the Department of Civil Engineering first as an instructor in plant design and then as lecturer in chemical engineering. (Although degrees in chemical engineering had been granted since 1928, a department did not come into being until 1946). These three appointments were to have a pronounced impact on the development of the Faculty.

Leroy Allan (Chick) Thorssen was born in Grantsberg, Wisconsin in December,

1916. He moved back to the family farm in the Namaka district of Alberta, some 50 miles east of Calgary, where he obtained his elementary education. He attended Connaught and Central High School in Calgary and proceeded to Mount Royal College in 1934-35. He enroled in civil engineering at the University, graduating in 1939 with High Distinction.

During his undergraduate days, he took an active part in student affairs, winning the Engineering Institute of Canada Prize at the end of his third year and was elected President of the ESS in his final year. Chick was an innovator: he organized the first Engineering Ball, complete with engineering displays. The tremendous success of that first Ball grew even greater in the forties, fifties and on into the eighties. Each year "Engineering Week" at the University now culminates with the Ball.

L.A. Thorssen

After graduation, he spent the summer as Resident Engineer at the Penhold Airport. That fall, to meet the needs of an increased enrolment in the Faculty, Dean Wilson hired Chick as a sessional lecturer and he proved to be a dynamite lecturer.

Chick worked in the summers of his first six years with the Faculty on construction projects: 1940 - Currie Barracks, 1941 - Minnewanka Power project, 1942 - Shipshaw Power development, 1943 - MacKenzie River Transport for supplying the Canol pipeline project. He carried a heavy teaching load in strength of materials and related areas and carried out several research projects related to the war effort. One project was operation Habakkuk. This was a code name for the construction of ice islands in the North Atlantic to act as airfields for fighter planes which could protect convoys on the way to England. The project required a knowledge of the engineering properties of ice, and this, Chick, along with many others, sought to get during the winters of 1942 and 1943.

He took a sabbatical leave in 1945 to attend the University of Iowa where he earned his master's degree under Hunter Rouse. Webb's death had left a vacancy in the teaching of hydraulics and courses related to water supply and sewerage. Chick returned to the University in 1946 and was appointed Associate Professor and Secretary of the Department of Civil Engineering. He reorganized, updated and modernized the fluid mechanics courses which was a major accomplishment. His biggest thrust was in the courses relating to concrete. In addition to bringing them up to date, he organized and offered several extension courses in the design and control of concrete to large numbers of practicing engineers and contractors.

His research efforts were impressive; he successfully worked to understand and combat the deterioration of concrete due to alternate freezing and thawing. Thorssen maintained an active consulting practice relating to concrete and concrete products. He set up three engineering and materials testing firms in the province in the years from 1946 to 1952. His success was responsible for his decision to accept one of the many exceptional offers from private industry. He resigned from the University in 1952 to become Executive Vice-President and General Manager of Standard Holdings. He held this position until 1969 when he resigned because of ill health.

Chick maintained his interest in academic activities after he left the University. He served as Chairman of the Board of Governors of the University of Calgary and in 1970-71 as Chairman of the Alberta Universities Commission.

His service to the public brought many honors and awards. In 1970, he was awarded the Doctorate of the University of Calgary, in 1971, the Centennial Award of the Association of Professional Engineers, Geologists and Geophysicists of

L.E. Gads

Alberta, and in 1983, the Order of Canada. From 1976 to the present, Thorssen has lived in semi-retirement in Calgary, where he is a keen observer of provincial affairs.

Leonard Eustace Gads was born in Bukhara in Russian Turkestan on April 30, 1907. The family enjoyed a life of privilege in Irkutsk, on the southwest corner of Lake Baikal, where Leonard's father was the President of the District Bank. They fled to safety when the revolutionary forces swept down on Irkutsk and Len would tell hair-raising stories of his family and other loyalists dodging hostile troops as they made their way to safety in Harbin, Manchuria. Gads received a classical Russian education during his student years in Irkutsk and later in Harbin. He received excellent grounding in science, mathematics and the humanities and became skilled in fencing and sabre fighting. He had a good command of Russian, French and English. Few students of his age in Alberta had a high school education of this calibre. Shortly after arriving in Harbin, Gads' father died. His mother remarried and when a partial amnesty was granted to Czarist refugees, his mother, stepfather and sister accepted it and returned to Russia. Leonard was nineteen years old, and he decided to emigrate to Canada.

Before leaving Harbin, Leonard earned a meagre amount of money driving a taxi cab. He set off for Vancouver via Tokyo in 1926. While waiting to catch the boat he was "rolled" and lost his savings except one gold coin and his father's presentation watch embossed with the Czarist crest. His first glimpse of Canada was through the bars of an immigration office window in Vancouver. Somehow, Gads made his way to Wetaskiwin where he was sponsored by a fellow countryman. His sponsor was a harsh man who demanded a tremendous workload from the inexperienced youth and offered little in the way of support. Several years passed before Gads was able to transfer to another farm where his life became much more pleasant. Gads worked for thirty dollars a month, plus his keep. He made lifelong friends in the Wetaskiwin area, particularly within the Scandinavian community. After ten years of work as a farm laborer, he had saved enough money to enrol in the Department of Civil Engineering at the University of Alberta.

Gads (standing) working as a farm laborer in the Wetaskiwin area.

Gads was 28 years old when he enroled in engineering at the University. He graduated in 1939, at age 32, with his degree in civil engineering. Gads joined the Faculty of Engineering in September of that year. After teaching for two years, he joined the Burns meat packing firm as a time-and-motion expert. Gads enlisted in the Royal Canadian Air Force in 1942 as a navigational instructor. He retired from the Air Force in 1945 and served the British Government as a conference interpreter with the Control Commission in Berlin.

Gads returned to the University at the urgent request of Dean Hardy, as an Assistant Professor of Civil Engineering and Secretary of the Faculty. He was appointed Professor in 1956 and Associate Dean in 1969, a position he held until his retirement in 1971. In addition to his administrative duties, he carried a heavy teaching load in the junior years related to surveying, astronomy, graphics and the engineering profession. His popularity came from his original way of delivering lectures. The students enjoyed his mastery of the appropriate joke which would have a direct bearing on the point he was making to the class.

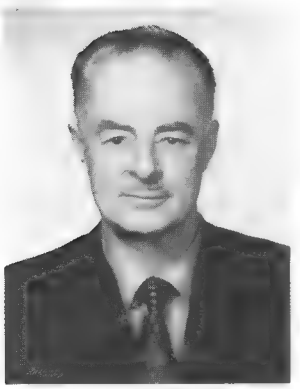
Gads served on numerous university and professional committees throughout his career. He served his profession and those closely allied to it as Chairman of the Board of Examiners in Architecture and as Chairman of the Board of Examiners in Surveying. He was appointed a Life Member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta and received the Association's Centennial Award in 1972 in recognition of his contribution to the engineering profession. He was an Honorary Life Member of the Association of Land Surveyors of Alberta and an Honorary Life Member of the Alliance Française of Edmonton. His sense of humor and varied public interests were attributes which made him a popular public speaker.

He maintained an active interest in Russian culture. Travel and research developed his keen insight into various aspects of modern Russia throughout his life. When he became a Canadian citizen, Leonard made a difficult and very personal decision. He changed his name from Gadiatsky to Gads. In spite of the many hardships he suffered after fleeing from Russia, he never lost his love for the people and for the culture of Russia. Len came to love his adopted country and was a fiercely loyal and proud Canadian. Warm sentiments remained toward his native country, complementing and enriching his Canadian loyalty. His health began to fail and in 1971 he retired as Associate Dean. He continued teaching on a part-time basis until 1972, when he retired and was appointed Professor Emeritus. Leonard Gads left his mark on the University he served faithfully and well for almost 30 years. Most of the engineering students came into contact with him during his years of service. To many, that contact was much more than the normal staff-student relationship. He was a concerned counsellor and a trusted friend.

George Wheeler Govier was born in Nanton, Alberta and received his secondary school education in Vancouver. He attended the University of British Columbia where he obtained his B.A.Sc. in Chemical Engineering in 1939. He received his master's degree in Physical Chemistry from Alberta in 1945 and his Sc.D. in Chemical Engineering from the University of Michigan in 1949. Govier joined the staff of the University of Alberta in October, 1940, rising from Instructor to Head of the Department of Chemical Engineering in 1948 and he was appointed Dean of the Faculty on July 1, 1959.

He was a dynamic lecturer and a very able administrator. He organized the newly-formed department of chemical engineering. Soon, he had it functioning as

one of the top-rated chemical engineering departments in Canada. His administrative skills came into play when he became Dean. He planned the Engineering Centre in the northwest section of the University. His concept is still under active consideration (land to house a central administrative area and general purpose classroom space together with space for new and enlarged facilities for civil and electrical engineering is reserved for future development).



G.W. Govier Dean of Engineering 1959-1963

His teaching was mainly confined to the senior years in the area of unit operations and two-phase flow. In the late forties, when Alberta entered the new oil age, he made certain his department responded to the need. In 1950, he added a petroleum option to their curriculum. He has been active in research in the area of two-phase flow and he is author or co-author of over 60 technical papers on subjects of his research, engineering education, and energy resource conservation and management and senior author of an engineering textbook on "The Flow of Complex Mixtures in Pipes."

Govier joined Alberta's Oil and Gas Conservation Board in 1948 and was Chairman of the Board, now the Energy Resources Conservation Board, from 1962 to 1978. He had a two year leave of absence from the Board to serve as Chief Deputy Minister of Energy and Natural Resources for the Government of Alberta. He returned in 1977 and continued with the Board until his early retirement in September, 1978. During the later years of his services with the Board he was Vice-President of the Petroleum Recovery Institute, 1976-79, and Vice-President of the Coal Mining Research Centre, 1978-79.

Govier resigned as Dean when his responsibilities for the provincial government increased. In 1963, he moved to Calgary to accept the full-time responsibility of the Conservation Board. His interest in engineering education continued and during the 1963-75 period, he was a part-time professor of engineering at the University of Calgary.

In 1978, he formed and is an active President of an energy resource management consulting firm, Govier Consulting Services Ltd. He is an energy resources consultant to the Royal Bank of Canada, and has served as consultant to the Public Petroleum Corporation of Greece, Commissioner and consultant for the Government of British Columbia and as a consultant to the Government of Alberta and a number of energy resource corporations. He was a Member of the National Research Council of Canada from 1980 to 1982. In 1985, he served as advisor to the Government of Canada and of Newfoundland on matters relating to the establishment, organization and staffing of the Canada-Newfoundland Offshore Petroleum Board. In 1986, he was appointed to the Federal-Provincial Pipeline Review Panel charged with making recommendations respecting Canada's major natural gas pipelines and the move to market-oriented pricing of natural gas.

Govier is Chairman of the Board of Directors of International Permeation Inc. and a Director of Canadian Foremost Limited, Texaco Canada, Inc., Combustion Engineering Canada Inc., Canadian-Montana Gas Company Limited, Canadian-Montana Pipe Line Company, Roan Resources Limited, Stone & Webster Canada Limited and the Cooperative Energy Development Corporation. He is a Life Member and a past President of the Association of Professional Engineers, Geologists and Geophysicists of Alberta and a Member and past National President of the Canadian Institute of Mining and Metallurgy, a Fellow of the Engineering Institute of Canada, the Chemical Institute of Canada, the American Institute of Chemical Engineers and a Foreign Associate of the National Academy of Engineering of the

United States. He has represented Canada at the World Petroleum Congresses and from December 1975 to September 1983 he was Chairman of the Scientific Programme Committee of that organization. In recognition of his many contributions to his profession Dr. Govier has received a number of awards and honors including the R.S. Jane Memorial Award of the Chemical Institute of Canada (1964), the Sesquicentennial Award of the University of Michigan (1967), the Canadian Centennial Medal (1967), Centennial Award of the Association of Professional Engineers, Geologists and Geophysicists of Alberta (1970), the Selwyn G. Blaylock Medal of the Canadian Institute of Mining and Metallurgy (1971), the Gold Medal of the Canadian Council of Professional Engineers (1976), and the Achievement Award of the Government of Alberta (1976). He was named 1978 "Oil Man of the Year" by Oilweek Magazine. In 1976 he was named a Member of the Order of Canada and in 1982 he was elevated to Officer of the Order of Canada. He is the recipient of the Doctor of Laws, *honoris causa*, of the University of Calgary (1976), the Doctor of Science, *honoris causa*, of McGill University (1981), the Doctor of Engineering, *honoris causa*, of the University of Waterloo (1985).

Chapter 8

World War II and the Aftermath

December 7, 1941 - Pearl Harbour. The United States was officially in the war. In the spring of 1942, a small scale invasion was made in the outer islands of Alaska. One sunny Sunday morning in March, Edmontonians awoke to the arrival of "troop trains" from the United States and for the next four years Edmonton was an occupied city. Edmonton had become the command post for the building of the Alaska Highway. Men and materiel from both countries were quickly assembled under the direction of the U.S. Army Corps of Engineers and the United States Public Road Administration. Selective Service was rigidly enforced in Canada. Everyone, including young engineering graduates, was placed in positions decided upon by Selective Service. Freedom of choice was lost to Canadians for over six years. As a consequence, many of the graduates and undergraduates on summer employment were directed to work on the highway. In eight short months a passable road was punched through to Fairbanks linking the airports on the northwest staging route. The next 45 years have been spent straightening, reducing the grades and paving the highway.

In 1942, registration in first year reached a record high of 183, with a total enrolment of 367. Harry Webb's tragic death resulted in the need for instructors, and Dean Wilson requested Selective Service to release Elio D'Appolonia, George Ford, and Ralph McManus from work on the Alaska Highway. We arrived at the University late in September. We were kept busy for the next four years assisting with the teaching of engineering. The incredible influx now exceeded 15 per cent of the University enrolment. The salary for instructors was a meagre $800 a session. Twenty per cent of the $800 was paid in funds that were valid for purchasing goods made in Alberta so we were not able to pay our room and board with that portion. As a consolation prize, a graduate program was reinstated in civil engineering and over the next four years the instructors "worked off" their master's degrees. Dudley Blair Menzies, the city engineer, was appointed special lecturer in sanitary engineering and for the next several years continued to assist the Faculty in this respect. Leslie Howard McManus was appointed special lecturer in highway engineering and he held this position for several years. Les became Deputy Minister of Highways and maintained a keen interest in the affairs of the Faculty.

In 1941, special courses in electronics for naval and air personnel were begun. Classes of 100 and over were given short courses and sent on their way. The University records of that time show the immense effort that went into the electronic training in the early years of the 1940's, and the dedication of the three members of the Department of Electrical Engineering (Cullwick, Cornish and Porteous) who

D.B Menzies

taught the special courses in conjunction with the regular engineering program.

John Henry Waghorne, an M.Sc. graduate from Queens and Ronald Edward Phillips, a graduate from the University, joined the Department of Electrical Engineering in 1942. John Waghorne was a lecturer for four years and then returned to eastern Canada. Ron Phillips remained with the University until his retirement in 1985. He was made an Assistant Professor in 1945 and an Associate Professor in 1954. In 1963, he accepted the position of Superintendent of Buildings. He was appointed Vice-President of Planning and Development in 1975 and then Vice-President of Facilities and Services in 1980.

L.H. McManus

In the fifth verse of the first chapter of the Book of Habakkuk of the Old Testament it may be read "For I will work a work in your days, which ye will not believe, though it be told you." Habakkuk was the code name for an idea that absorbed the resources of the National Research Council and universities in western Canada in 1942 and 1943. The idea: one or more floating islands of ice in the North Atlantic, each weighing at least two million tons, two thousand feet long, three hundred feet wide and at least two hundred feet deep for use as aircraft landing bases in the battle against submarines in the North Atlantic. Similar islands would be used in the ocean between Britain and Murmansk as bases for fighter aircraft, so that air coverage could be provided for the entire run to Russia.

Churchill gave his enthusiastic endorsement to the project. The logical place for this work was northern Canada. Dr. C.J. MacKenzie, acting as President of the National Research Council, directed the project. It took up most of his time during the autumn and winter months of 1942 and 1943. The actual work was spread among the universities, especially those in western Canada. The work assigned to the Department of Civil Engineering at the University was directed by Professors I.F. Morrison and L.A. Thorssen. When the tests were performed during the months of January and February, 1943, the luxury of a walk-in refrigerator was not available and all specimen preparation and testing was done out-of-doors. Large-scale tests on columns and beams were made on ice taken from Patricia Lake, near Jasper, Alberta.

The test-site at the University was outside the South Lab, tension specimens were made by freezing tap water and tap water-snow mixtures in briquet gang molds used in the standard tension tests of cement. Unfortunately, the ice cracked during the molding or else broke in the jaws of the tension machine. Test results were unsatisfactory and this part of the test program was abandoned. Standard 6-inch x 12-inch cylindrical compression specimens were molded and tested with fair results. Compressive strengths in the order of 550 pounds per square inch were obtained. A series of 4-inch x 4-inch x 4-feet plain icebeams and others reinforced by three quarters of an inch square wooden rods were molded and tested. The differential expansion of the ice and wood caused problems that were largely overcome by thoroughly soaking the wood reinforcing rods. Load deflection observations were made, fracture patterns and modes of failure were noted.

R.E. Phillips

At Jasper, compression tests were carried out on large prismatic pieces of ice cut from Patricia Lake, ultimate strength and failure modes were observed. Failure appeared to begin by internal splitting at a stress of about 200-250 psi which so weakened the structure of the ice that it crumbled under the load. The ultimate strength attained was approximately 320 psi or about two-thirds that observed on the cylinders tested at the University. This lead to the suggestion that the addition of any fibrous material, such as hay, would have a beneficial effect. The few months

of work in early 1943 concluded the contribution of the University to this highly secret project.

However, the project did not terminate with these few tests. The Heat Section of the Division of Physics of the National Research Council constructed a model "floating island" of ice on Patricia Lake. Laboratory studies were performed at Ottawa on the physical properties of ice such as the strength of beams of ice reinforced with wood pulp, straw, and sawdust. The experiments and tests were sufficient to conclude that a structure of almost any size could be built. However, the great project was eventually defeated, more by considerations of time and money than by technical difficulties. It was realized that aircraft carriers could be built more quickly and more cheaply and in the long run they would be more effective than floating island air bases.

On August 7, 1943, the first section of 60 young men selected to enter the University of Alberta as members of No. 2 Canadian Army University Corps arrived at Camrose for basic training. These young men had been carefully selected from the top students who had completed grade twelve that year; all were under 21. The period at Camrose was a hectic one; they were required to serve on weekends, and take long route marches at night in order to complete their training before entering the fall session. The 60 enrolled at the University on the same basis as the regular freshmen engineers of that year; they took identical courses and received the same treatment including membership in the ESS. Their routine differed in that they were marched to and from their classes from their billets in St. Stephen's College and their study time was regulated. Their contribution to student activities made the term a more interesting one, plus their value to the engineers' athletics efforts was immeasurable.

Their one year stay at the University was overseen by Captain E.W. Newlands, Sergeant Hall and Sergeant Loder. After one year of training the men were sent on active service. A few were killed overseas, but most returned to complete degrees in engineering, a small number took geology while one or two went to other universities to complete degrees in architecture.

The 60 army engineers plus the 90 civilian students (the first imposed quota on freshmen engineers) combined with the 219 in the second, third and fourth years held the enrolment at 369. In addition, the electrical department provided special short-courses for 415 men of the Royal Canadian Navy. Cornish died in 1942, and for the next four years Ward Porteous acted as Head of the Department of Electrical Engineering.

Max Wyman

The math department, and, as time would tell, the University, were fortunate in obtaining the services of Dr. Max Wyman who maintained a great interest in the Faculty of Engineering. He taught an undergraduate engineering math course and joined his four senior colleagues in becoming another friend of the Faculty.

Max was born in Lethbridge, Alberta, attended Strathcona High School and entered the University in 1932 embarking on what was then a five year honors program in mathematics. He proved to be an excellent student, winning the University of Alberta Honor Prizes every year for five consecutive years. He graduated in 1937 with first-class honors in mathematics, the James Ramsey Gold Medal, and the Governor-General's Gold Medal. During his undergraduate days, Max was an active member of the Mathematics Club which was then a joint student-faculty affair. He gave papers on the mathematics of games of chance and on mortality tables and was president of the club during his final year.

At that time, the University was not equipped to give graduate degrees. He was encouraged to attend the California Institute of Technology where he obtained his Ph.D. (*magna cum laude*) in 1940.

After graduating from Cal Tech, where he held a teaching fellowship, Max was employed by the National Research Council of Canada as a munitions gauge inspector from 1940 to 1943, with an interlude as lecturer at the University of Saskatchewan in 1941-42. In 1943, Max returned to his alma mater as a lecturer and began his duties at the summer session.

Wyman's interest in engineering began in the fall and winter sessions of 1943-44 . He would drop in on the graduate course in the Theory of Elasticity being given by Professor I.F. Morrison, and quite often he would present a lecture or two. The engineering problems presented by Morrison to his students attracted Wyman and he wrote several excellent papers related to this work. In later years he was to remark that he got more comments and inquiries on the paper dealing with concentrated loads on elastically supported plates (aircraft landing on ice on the northern lakes) than on any of his other papers.

In response to the needs of the senior students in Engineering Physics and to those in graduate work in physics and engineering, he offered a course in Complex Variables. The first time he gave the course he seemed to pour out his entire knowledge of mathematics. The math just streamed forth. The class begged for mercy. He claims it was the only time a class ever called a strike on him. Those who survived that course had their background in mathematics enhanced immeasurably and many went on to complete their Ph.D.'s in mathematics, physics, and engineering. He was truly an excellent lecturer. He visited the noon luncheon bridge games in the South Lab. His prowess in this area frightened the group of regular players; he was a formidable player and a delight to watch. His love of the game continues to this day.

Max Wyman proceeded steadily through the various academic ranks. He became a full Professor in 1956 and Head of the Department of Mathematics in 1961. As Head, he displayed a gift for administration and organization, and an ability to delegate responsibility to others. He combined active research with conscientious teaching. Wyman produced a long succession of papers dealing with Einstein's field equations in general relativity and with asymptotic series and special functions. His uncanny ability to solve differential equations led to new results in field theory. After he became Dean of Science in 1963 and Academic Vice-President in 1964, he managed to snatch a few early morning hours to continue his research and to write a book on asymptotic expansions.

In 1969, he succeeded Dr. Walter Johns as President of the University and for the next five years he led the University through a period of rapid building expansion. Max Wyman retired as President in 1974 but continued his research and his teaching until 1981, and this always included a class of second year engineers. He has the time now to enjoy golf, the ponies, and bridge.

Professor Pitcher retired in 1944 and Dr. A.D. Hogg was appointed Assistant Professor of Mechanical Engineering. The first of the veterans (seven in number) made their appearance at the University in a pre-engineering course; enrolment dropped to 348. With time on their hands because of the reduced enrolment (in a pig's ear), the Department of Civil Engineering gave a well-received short course in soil mechanics and concrete to 134 practicing engineers. The RCAF Canteen, just west of Assiniboia Hall, was made into a drafting lab for first and second year

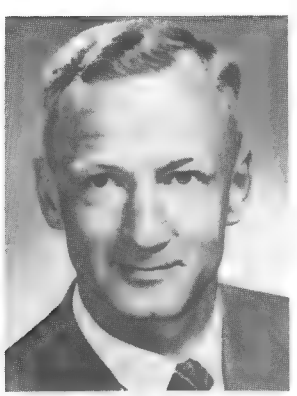
students. It was furnished with space-efficient drafting tables designed by Wally Preston. Lighting was, for the first time in "umteen" years, adequate for drafting purposes. This was the home for drafting courses until the completion of the new civil engineering building in 1955. University enrolment now stood at 2,023.

Special Survey School Assignment Party at Boy Scout Camp - Sylvan Lake April 1934. Dean R.S.L. Wilson, Prof. H. Webb, Frank Hastie, Bruce Hurdle, Alex Piercey and Tom Patching with Scout Leaders.

Survey School 1934

The war in Europe was nearing an end; veterans appeared in large numbers at the University. In September 1945, 167 veterans and 48 civilians registered in first year engineering. In January 1946, 138 veterans plus eight civilians enrolled. Registration in engineering soared to 654 for that session and classes in first year continued through the entire year. What a load on the staff! What a load on the facilities! Every room at the University including the old wooden three-story classroom on 84th Avenue and the former Normal school on the corner of 82nd Avenue was filled and the hurriedly constructed, temporary quonset hut classrooms were poorly ventilated, poorly heated and poorly lighted. Bodies were crammed into every conceivable quarter. In the South Lab, a classroom for 100 students was built in the upper section above the test lab, with offices below.

Stewart Ronald Sinclair and Jack Longworth were added to the staff of Civil Engineering along with other junior staff personnel. Stew remained with the Department of Civil Engineering for the rest of his career, specializing in the teaching of soil mechanics. In 1958 when George Ford was named Head of the Department of Mechanical Engineering, Stewart was appointed Secretary of the Department and in the following year when Govier was appointed to the Deanship, Sinclair was named Head of the Department of Civil Engineering, a position he held until he resigned it on June 30, 1973. Stew stayed on as a professor of civil engineering, teaching soil mechanics. He carried on a restricted consulting practice. On August 12, 1976, he died of a heart attack while working at his fishing lodge in the Caroline country.



S.R. Sinclair

Jack Longworth spent his career in the Department of Civil Engineering teaching in his special field of structures to countless numbers of very satisfied students. He was a very effective teacher. His lectures were always a balanced blend of theory and practice. They were models of perfection. Jack graduated with distinction in 1945 winning the Association of Professional Engineers' Gold Medal. He was awarded a scholarship at the University of Illinois where he obtained his master's degree in 1947. He joined the staff of the Department of Civil Engineering as a sessional lecturer rising steadily through the ranks to be appointed Professor in 1962.

Jack believes that a member of a professional faculty should practice that profession. Accordingly, he carried on a consulting practice, first in association with Professor I.F. Morrison, then with his own firm.

In spite of his heavy commitment to teaching, research and administration, Jack made significant contributions to his technical and professional associations. He served on the council of the Association of Professional Engineers and was chairman of their discipline committee during the period 1960-62. His expertise in structures brought many calls for service. Over the years he has served as a member or as chairman on national committees related to structural design and performance. Among them may be noted those related to the National Building Code and the Canadian Standards Association. In recognition of his services he was presented with the L.C. Charlesworth Award in 1977. Jack served a year as Assistant Dean, was Acting Head of the Department of Civil Engineering for the 1962-63 term, and Chairman for the three year period 1976-79. Although he took early retirement in 1983, he still returns from time to time to oversee some research on timber structures.

J. Longworth

Jack Longworth received an Honorary Doctor of Divinity from St. Stephen's College in September of 1986, in recognition of his years of devoted service to the United Church of Canada.

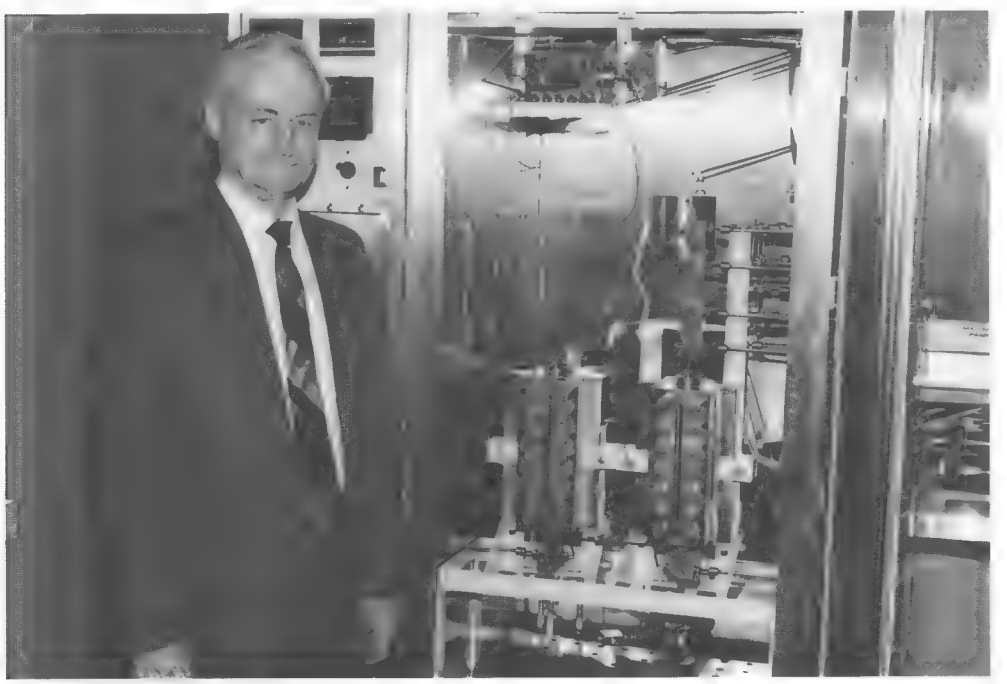
By 1946, veterans were present in great numbers. The same year, 282 veterans and 101 civilian students registered in first year; total enrolment in engineering jumped 34 per cent to 874. Dean Wilson retired and Bob Hardy was appointed Dean. Len Gads was recalled from Berlin to become Assistant Professor of Civil Engineering and Secretary of the Faculty. Dr. James A. Taylor was appointed Professor and Head of the newly formed Department of Chemical Engineering. (Prior to that time Chemical Engineering was administered by a committee chosen by the Faculty from the Department of Chemistry.) Dr. Taylor's sojourn at the University was a short one; he resigned in 1948.

The veteran invasion was in full swing. Classes were filled to a degree that would not be experienced again until 1978. Once again we outdid Air Canada; classrooms were overbooked by fifteen to 20 per cent. Lectures ran from 8:00 a.m. till 8:00 p.m. Laboratories ran mornings, afternoons and evenings. It was an exciting time. Staff, graduate students, and undergraduates were one large family; all shared common dining facilities in the Hot Caf and enjoyed each other's company in less than ten per cent of the space now in use. Equipment dated back to the 1920's or was homemade. There were only two laboratory technicians: one in civil and a part-time one in mining. One electrician served the entire campus and he did not have fancy voltmeters or ammeters - just his fingers. He would dry his fingers on his trousers and stick his fingers across the outlets. The size of the jolt told him the voltage. There was one phone for all of civil engineering, one secretary for the Dean, and one washroom under the stairs; those over six feet tall had to kneel to use it.

Money was non-existent, but user fees, which kept the faculty out of hock, were in full swing. If anything was broken (a test tube, a surveyor's chain, an axe handle or even a plumb-bob string), it was paid for in cash, or examinations were denied. Often the debt was paid by cheque; the cheque was held until sufficient funds could be borrowed to meet the obligation. When survey school was offered in the spring, money had to be raised to feed the pet spider which provided the cross hairs for our transits and levels! Engineering was under fire. All the equipment we owned was rented out at usurer's rates of ten per cent of the cost per month. A

commercial testing service was set up which provided funds to buy new equipment. The Faculty forged ahead turning out graduates who were gobbled up by the ravenous oil industry.

Industrial tours were reinstated, third and fourth year chemicals going one year and third and fourth year mining students the alternate year. Despite this overwhelming display of ingenuity in coping with bare essentials, more resources, especially instructors, were sorely needed. Dean Hardy remained calm under all this pressure. Through a haze of his cigarette smoke and fallen ashes, he gave assurances that help was on the way.



Don Robinson with phase equilibrium apparatus.

D. Panar

It came in the form of David Panar, an Edmonton boy who took his first two years at the University, then graduated from the University of Michigan in Mechanical and Industrial Engineering. Then, as now, Dave was Mr. Everything: lecturer, storyteller, entrepreneur, assistant to the Deputy Minister of Public Works and fly-boy (he piloted used aircraft into Israel). In the University environs he drove his topless MG with reckless abandon. Give him a ten minute lead and he could prepare and present a lecture on any required topic. His subject matter may not always have been relevant to the assignment, but his energetic and engaging manner generated the enthusiasm and interest that overrode any criticism. For the next 20 or more years, he was a tower of strength in teaching the service course in Mechanical Engineering and in developing the degree program. He was a willing and effective teacher; he always had an excellent rapport with the students. During most of his tenure with the University he acted as a consultant for the provincial Department of Public Works. When his Government and private practice expanded, he resigned as a full time member of staff. Dave loved teaching, and returned to the University as a special lecturer giving courses and telling stories to the students in Mechanical

Engineering. Now retired, he can be reached at his consulting office, where he is always pleased to share his expertise.

That same term saw the appointment of Henry Kasten along with 12 other fresh graduates to assist with the ever expanding laboratory and teaching chores. Henry remained with the Department of Civil Engineering for nearly a decade. He left to practice as a consulting engineer specializing in structural design and in the repair of buildings that had suffered damage due to poor design.

From 1908, until the spring of 1965, engineering students, regardless of branch, were required to take survey school at the end of both their first and second years. It was a most valuable experience for all, giving them first-hand knowledge on the meaning of accuracy and precision. For many students it provided an employable skill which could be used during the summer periods. Students who failed their regular course stayed to complete survey camp in order to have a marketable skill. The logistics of providing the necessary exercises which went into survey training now became a living nightmare. Equipment was old and scarce and there were few funds available to buy additional equipment; every transit, every level, every chain had to be kept in working order. It was a monumental task, that went from 7:00 a.m. to noon each day for the freshmen and from 1:00 p.m. to 6:00 p.m. each day for the second year students. It crested in spring of 1946, when well over 600 students participated in the 20-day survey period. Each noon and each evening the equipment was checked in, given a hurried inspection, repaired if necessary, and posted out for the next shift. The junior instructors became expert in the two-peg test to adjust levels, transits could be checked and adjusted in twelve minutes, chains mended in a minute or two, axe handles took a little longer to replace. The repair shop kept a spider in a small match box; each day it was required to spin a fine web which was caught on the arms of an expanded pair of dividers and used as the replacement for any cross-hairs which had become dislodged. For most students and even the harried staff it was, when the weather was good, a happy, hectic, carefree time. Then, at seven o'clock at night during the last two weeks of survey school the second year students had to take their star shots! The beginning of star shots generally brought a change in the weather, to cold, cloudy nights. Panic would seize the entire group - could they get their shots in, and if they could, were they any good? Somehow or other, like the daytime exercises, all were completed, and few failed, but many a long night was spent cooking the results so that Edmonton was not located in eastern B.C.

E. D'Appolonia

In the summer of 1946, D'Appolonia left for the University of Illinois and Ford went to Stanford to complete graduate studies. McManus remained for three years before leaving for Illinois to complete his graduate work.

Some 20 appointments were made in the 1947-48 session. Three permanent and three sessional appointments were to have a lasting impact on the development of the Faculty. Thirteen others were also brought on staff as sessional instructors, or graduate research assistants. Jim Harle was appointed Professor and Head of Electrical Engineering; Frank James Hastie, Associate Professor of Electrical and Mechanical Engineering and Superintendent of Buildings, Thomas H. Patching as Assistant Professor of Mining and Metallurgy (Frank and Tom entered the University together as freshmen in 1932, were survey school partners and both graduated at the top of their respective classes in 1936); Pat Bouthillier, Gerry Sadler and Bob King were each appointed as sessional lecturers.

By 1947, the Department of Electrical Engineering had, through death and

attrition, shrunk to a corporal's guard, Ward Porteous and Ron Phillips. They needed more than help. Those related in any way to mechanical engineering were cut loose from civil engineering and assigned to electrical engineering. That gave them a body, and their soul came in the form of Professor J.A. (Pappy) Harle.

J.A. Harle

Jim Harle was born and educated in Newcastle-Upon-Tyne, England. After a short apprenticeship with C.A. Parsons and Company, he entered Kings College at the University of Durham as a degree student in electrical engineering, graduating with distinction in 1919. He remained on staff for three years. In 1921, he obtained his master's degree at the University. In 1922, he was invited to join the Technical and Research Department of Messrs. A. Reyrolle and Co. Ltd., Electrical Engineers. In 1937, he was promoted to department head, responsible for the operation of their chemical, mechanical and electrical laboratories. Harle served as technical and scientific advisor to the management and design staff of Reyrolle. He spent 25 years with the company. During this period he became an authority on high voltage control, switch-gear, and the design of protective relay systems for transmission and distribution networks.

Harle joined the Faculty as Head of the Department of Electrical Engineering in 1947. He guided the electrical department through its great expansion period and brought it into close contact with the power industry of the province. Jim retired in the fall of 1964 and returned to England. Within a year he died of heart failure.

Frank Hastie was born and educated in Edmonton. Before entering the University he spent two years as a laboratory assistant in the fuels research division of the Alberta Research Council. He stood at the head of his class when he graduated in electrical engineering in 1936. He worked for four years as a maintenance engineer with Canada Packers; then he joined the East Kootenay Power Company. Hastie served overseas with the Royal Canadian Engineers from 1942 to 1946. He rejoined East Kootenay Power when he was discharged. In September 1947, he was appointed Associate Professor of Electrical and Mechanical Engineering as well as Superintendent of Buildings. He was a well-liked lecturer, but soon the work of Building Superintendent took all of his time. During his eight-year stay he led all the singsongs and taught innumerable verses of the "Sergeant Major" at all student engineering functions. For a little guy (five-foot six-inches) he had a big job in developing a well-run plant that eventually became the Canadian model of efficiency. The University of Toronto was so intrigued by Hastie's operation that in August 1955 he moved to the University of Toronto to direct their expansion plans and to act as their fire chief and chief of campus security. He was last seen roaring down Yonge Street in the chief's car blasting forth on the siren.

T. Patching

When Norman Pitcher retired as Professor of Mining Engineering, the Department was left with a vacancy to fill. Students were clamoring for classes in mining. Tom Patching, like Frank Hastie a 1936 graduate, accepted an appointment as Assistant Professor of Mining Engineering in 1947. After graduation, Tom was employed by International Nickel Co. Ltd., first as a miner, then as an engineer. In 1942, he joined Hudson's Bay Mining and Smelting Company at Flin Flon as a mining engineer.

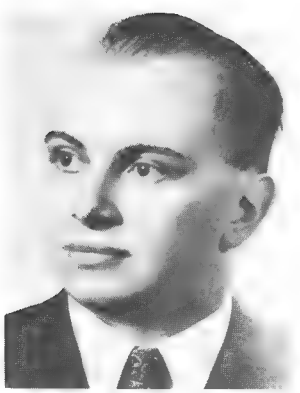
Tom proved to be a successful, conscientious and respected instructor. He carried the entire burden of the teaching of mining engineering at the University for nearly 35 years. During that time he earned a reputation as one of Canada's leading experts in mining engineering. He moved rapidly through the ranks becoming a full Professor in 1958. His research efforts during most of his career centred on sudden

outbursts of gas from coal.

Patching served his profession well, as a Member of the National Advisory Committee of Mining and Metallurgical Research from 1964 to 1977, President of the Canadian Institute of Mining and Metallurgy 1971-72, member of the Province of Alberta Grande Cache Commission, 1973, and Chairman of the Royal Commission of Inquiry, Cape Breton Development Corporation 1974, to

> examine all circumstances leading to accidents causing bodily injury and property damage and look at the physical conditions and existing work practices and their effects on the workers.

In his final two years on active staff, he served as a member of the Technical Advisory Committee of the Provincial Government Coal Mining Research Centre and as a Chairman of a Task Force to study the impact of the coal industry on the economy of western Canada, for the Canada West Foundation. Tom retired on August 31, 1980, and for several years returned to the Department to continue his research on coal outbursts.



P. Bouthillier

The two sessional appointments, Bouthillier and King, remained at the University until their retirements. Pat Bouthillier, a native Albertan, attended the University earning his bachelor's degree in civil engineering in 1944. After working for Imperial Oil for two years he went to Harvard University where he obtained his master's degree in Sanitary Engineering. Pat joined the Department of Civil Engineering as a sessional instructor in September, 1947. He was appointed an Assistant Professor in 1951, and Professor in 1965. From 1985, until his retirement in 1987, he served the Department of Civil Engineering as Associate Chairman for Graduate Studies.

During the summers of 1948-51, Pat was in charge of a research project dealing with water supply and farm sanitary facilities. The two pamphlets "Farm Water Systems and Sewage" and "Treatment of Farm Water Supplies" were of great assistance to the rural residents and were used throughout the province for a decade or more. In the early 1950's, Pat originated the first stream pollution and waste treatment assessments for the provincial Department of Health. He subsequently carried out similar studies on the rivers in the central and southern parts of the province. With the advent of the oil and gas industry, Pat broadened his interests and played an important role in setting stack emission standards for gas plants in the province. His students remember him as an enthusiastic, caring teacher with a strong sense of humor and one who always enjoyed playing the piano at any of their gatherings.

R. King

Bob King was one of the "Army Engineers" who spent the 1943-44 session in first year engineering. He graduated in 1947 with his undergraduate degree in electrical engineering and was immediately recruited by Professor Harle as a sessional instructor. He carried an exceptionally heavy teaching load in power engineering for many years and performed many of the administrative chores as well, doing yeoman service in such areas as timetabling, and machine shop liaison. In addition, King carried out high voltage testing for the Provincial Laboratories, and during the 1950's and 1960's did design work for the University Distribution System and for the provincial Department of Public Works.

While Bob was not involved in research *per se* his broad knowledge and willingness to contribute to the work of others made him a respected and valued resource person. Ill health plagued him for most of his career but he struggled on, retiring

in 1985.

Gerald Wesley Sadler received his degree in Mechanical Engineering from the University of Saskatchewan in 1947 and immediately joined the Department of Electrical Engineering as a sessional lecturer in Mechanical Engineering and an assistant in the office of the Building Superintendent. In 1949, he took a leave of absence to obtain his master's degree at the University of Illinois. He was appointed Assistant Professor in 1952, Associate Professor in 1956 and Professor in 1976. In 1953 he was appointed Acting Director of Physical Plant and Director in 1955. When a Department of Mechanical Engineering was formally constituted in 1959, Gerry chose to become a full time member of Mechanical and leave his work with Physical Plant. In the fall of 1959, he took a year's study leave at the University of California, Berkeley Campus. On his return, he became an active and valued member of staff in the thermoscience area of Mechanical Engineering.

The 1947-48 session was an active and heavy one. Graduate work was in full swing in all departments. Bob Hardy's research was taking off and he enrolled the largest number of graduate students in his courses in soil mechanics. A degree course in petroleum engineering was proposed by George Govier and planned for the next session. In cooperation with the Faculty of Agriculture, a degree program in Irrigation Engineering was planned for the fall of 1948. After long years of debate, stretching back to the motion in council by Professor Alexander and Professor Lewis in 1913, the Faculty at last changed its name from the Faculty of Applied Science to the Faculty of Engineering.

With the abrupt departure of Dr. Taylor in 1948, George Govier left his graduate work at the University of Michigan to become Head of the Department of Chemical Engineering. During the course of his studies at Michigan, George met Donald Baker Robinson and persuaded him to accept the position of Assistant Professor in the Department of Chemical Engineering. Don moved quickly through the ranks, becoming Associate Professor in 1954 and Professor in 1958. When Govier became Dean in 1959, Don was appointed Head of the Department, a position he held until 1970, when he returned to full-time teaching and research.

Don Robinson

Don Robinson is the author or co-author of more than 100 publications in the area of thermodynamics. His research results have found wide application in the natural gas processing industry. The work of Robinson and his associates has resulted in the development of a simple yet reliable equation of state, the Peng-Robinson equation, together with necessary computer software to make it useful for design and engineering work related to the hydrocarbon recovery, transportation, and processing industries.

Don is now President of D.B. Robinson & Associates Ltd., a thermodynamic consulting service for gas and oil. He works from a beautifully equipped laboratory located in the Edmonton Research Park. His company is an excellent example of the university-industry interface and of the accomplishments that Albertans can achieve in research and development and high-technology manufacturing. The company specializes in the experimental measurement of oil and gas behavior at reservoir conditions, in computer software for fluid property and process calculations in the hydrocarbon industry, and in the manufacture of custom-designed high pressure equipment.

Don has had an illustrious career as a chemical engineering educator and is fondly regarded by his graduates for the quality of his contribution to their education. He is an authority in the field of thermodynamics. He has contributed mean-

ingfully to technical and professional societies. He served for many years on the Board of Examiners of the Association of Professional Engineers, Geologists and Geophysicists of Alberta and was the first President of the Canadian Society for Chemical Engineering. In recognition of his outstanding achievements the Canadian Society for Chemical Engineering presented him with the R.S. Jane Memorial Award in 1980, and in 1981 he received APEGGA's Centennial Award.

Govier also recruited a young Toronto graduate, Andrew Lee Scott, as a sessional lecturer. Lee remained on staff until 1955 when he returned to eastern Canada to accept a position with Imperial Oil in Sarnia.

In August 1948, Bob Hardy, while travelling in Europe, was put in touch with Thomas Blench who was in the process of deciding on a new career pattern after spending some 25 years in Pakistan as an irrigation engineer. The meeting led to Tom's appointment as a special lecturer in Civil Engineering.

T. Blench

Tom is an honors graduate in Civil Engineering from the University of Glasgow. Following his graduation he spent some 25 years in irrigation work in the Punjab. During his last few years in the Punjab he was in charge of the government's research division and following World War II he spent a year and a half as liaison officer for their American irrigation projects. He then terminated his contract and returned to Britain. Tom brought with him an outstanding background in river engineering, sediment transport and hydraulic modelling. He became a very competent lecturer, particularly at the graduate level. In the early days of his tenure he was affectionately referred to by the students as "Punjab." During the summers from 1949 to 1952 he worked for the National Research Council on the Fraser River delta model at the University of British Columbia. His work culminated in the publication of the book "Regime Behaviour of Canals and Rivers." His publications achieved an international reputation and on the basis of this work he applied for and was awarded a D.Sc. by the University of Alberta. Blench formed his own consulting company, T. Blench and Associates, specializing in problems of river regime, river and irrigation models, reclamation and irrigation project design, hydrology and specialized hydraulic structures. In 1972, he joined with Northwest Hydraulic Consultants and remains a director of that company.

In recognition of his contributions, he has been made a Fellow of the Institute of Civil Engineers in Britain, a Fellow of the American Society of Civil Engineers in the United States and a Fellow of the Engineering Institute of Canada and in 1973 he received the Centennial Award from the Association of Professional Engineers, Geologists and Geophysicists of Alberta. At the venerable age of 82 he still spends many mornings in his consulting office.

In June of 1948, I completed my graduate program at Stanford University and returned to the Faculty as Assistant Professor of Applied Mechanics. Eighteen sessional demonstrators and graduate student assistants were also appointed to assist with the teaching. The crest of the wave of student-veterans had reached third and fourth year. Nine hundred and twenty-seven students, not to mention graduate students, packed the Faculty. Classes ran from 8:00 a.m. to 8:00 p.m. with laboratories running until 10:00 p.m. Graduate students could have the equipment after the scheduled labs.

Instruction started in the new petroleum and irrigation programs and the Department of Chemical Engineering conducted its first "mud" school for the petroleum industry. It consisted of a short course on the principles and practice of handling drilling fluids as employed in the drilling of gas and oil wells.

J. W. Gregg

Ralph McManus was granted a sabbatical leave to complete his graduate work in structural engineering at the University of Illinois.

John William Gregg was the first appointment to the Faculty in petroleum engineering. He had transferred from second year engineering at the University to the University of California, Berkeley. Gregg completed his degree in petroleum engineering at Berkeley in 1949, and was appointed Assistant Professor at the University. Jack, as he was known, was instrumental in preparing the program and deciding on the required equipment and the necessary library material. The first graduates of the new program convocated in May, 1950. Jack was appointed Associate Professor in 1951. His consulting practice increased steadily and Jack decided that he could not devote sufficient time to his teaching and research duties. Accordingly, he resigned in 1957. When his successor, Dr. D.L. Flock, resigned, Jack agreed to commute between Calgary and Edmonton to provide the necessary courses but by 1970 he found the work together with the travelling too onerous and resigned. By this time, Don Flock had returned. Jack continued to be a respected consultant in the petroleum industry until his death in 1985.

Dr. Donald Quon, who had just completed his Sc.D. at MIT, was engaged by the Alberta Research Council and appointed as a special lecturer in Chemical Engineering with the understanding that he would work with Govier to develop a research program on natural gas utilization. Don enrolled in engineering in 1940 at the age of fifteen. He graduated with high distinction in May 1944 with the highest average in the entire fourth year class. He was the first recipient of the Henry Birks Gold Medal. Quon left the Research Council in 1958 to accept the appointment of Associate Professor in the Department of Chemical Engineering at the University. He was appointed Professor in 1964. When Govier was appointed Dean, Don assumed the responsibility for the senior course in Unit Operations. This was a key course in the fourth year chemical engineering program. His full potential as a lecturer was realized and appreciated. Unsolicited comments from his students testified to the quality and inspirational character of his lectures. As time passed his field of interest changed, but he kept abreast of the current developments in chemical engineering and incorporated them into his lectures. Don was appointed Associate Dean of Engineering in charge of planning on July 1, 1973. For the next four years he did an outstanding job for the Faculty and for the University. He was then seconded to the University's Priority Committee. There he generated and refined ideas in the organization and planning of University operations. From July 1, 1978 to June 30, 1979 he was a visiting scholar in the Department of Operations Research at Stanford University. While there, Don developed a working knowledge of the major American energy models and brought back the latest version of the PILOT energy-economy model which he adapted to Canadian conditions using a Canadian data base. Don took early retirement in 1980. He continues his work on energy modelling with the Alberta Research Council and each year returns to the Chemical Engineering Department as a special lecturer in Energy Resource Development.

D. Quon

In 1949, Anatol Roshko lectured in fluid mechanics and related subjects for a session. He went back to the California Institute of Technology to complete his Ph.D. He stayed on at Cal Tech to become a world authority on fluid mechanics.

When Chick Thorssen relinquished the position of Secretary of the Department of Civil Engineering, I was appointed as his replacement. Although total registration had slipped to 769 the graduating class of 275 was the largest one in the history

of the Faculty and was not exceeded until 1971. The 1950 class included the first graduates in petroleum and irrigation engineering.

For the following session three veterans and 148 civilians registered in first year. The total registration of 544 was now 57% of the peak but remained more than double that of the 1930-40 period. Three ten-day schools (Mud, Oil Treating and Gas Metering) all relating to the petroleum industry were given by the Department of Chemical Engineering. Specialized technical service to industry within the province was continued by all departments with major services being provided through Civil Engineering in the fields of concrete and soil testing.

R.N. McManus

Dr. Ralph Norman McManus completed his graduate work at the University of Illinois and returned to the civil department in the fall of 1951. Registration had dropped to 460. The very high demand for engineers made it difficult to attract graduate students; only seventeen were registered that term.

Ralph McManus was born in Lomond, Alberta, and completed his high school education at Garneau High School. He entered the University in 1938 registering in civil engineering, and was awarded the Engineering Institute of Canada prize at the end of his third year. He was granted his bachelor's degree in May 1942. In September he was seconded from the Public Roads Administration on the Alaska Highway to the position of sessional demonstrator in the civil engineering department. The next four years were spent instructing at the University in the winter months and working as a structural design engineer during the summer. He received his master's degree in 1946 and remained for a further three years at the University where he became a topflight lecturer in structural engineering. Ralph took sabbatical leave to attend the University of Illinois. He returned to his academic duties in the fall of 1951 and he immediately took on a heavy teaching and research load. His rapport with the students, both graduate and undergraduate, was excellent. They enjoyed his lectures which were always illustrated from his experiences in an ever-expanding consulting practice. His reputation as a structural designer brought him commissions. Ralph felt he could not fulfill his commitment to the Faculty; he took a leave of absence for a year, but continued to give the graduate course in structures. In May 1957, with deep and genuine regret, McManus resigned to become a full-time consulting specialist in structural engineering. He did remain as a special lecturer until 1961.

Ralph continued his very successful professional career in partnership with Tom Lamb. In the late seventies, their firm was sold to the employees and Ralph took on specialized projects with the provincial government where he first acted as Project Manager of the Capital City Recreation Parks, then as Project Manager of the Dickson and the Oldman River Dams.

In his report to the Board of Governors in 1930 President Wallace reiterated the need for a library building and noted that an Applied Science (Engineering) building would be the next academic building in the expansion of the University. Twenty years later in the autumn of 1951, the Rutherford Library was opened. On the 25th of November 1948, the campus was rocked by a great commotion. The cornerstone of the new library was to be laid that afternoon, The night before, the engineering students had stolen it and spirited it away. It could not be found! The president was not amused. Orders were issued, students rounded up and in the quiet of the noon hour, the cornerstone was put on a hand-sled and returned. However, on the journey, the cornerstone bumped off the sled and a corner chipped. What a catastrophe! But the ceremony went off on schedule, the stone was repaired and the first

Lieutenant Governor the Hon. J.C. Bowen laying the cornerstone of the A.C. Rutherford Library

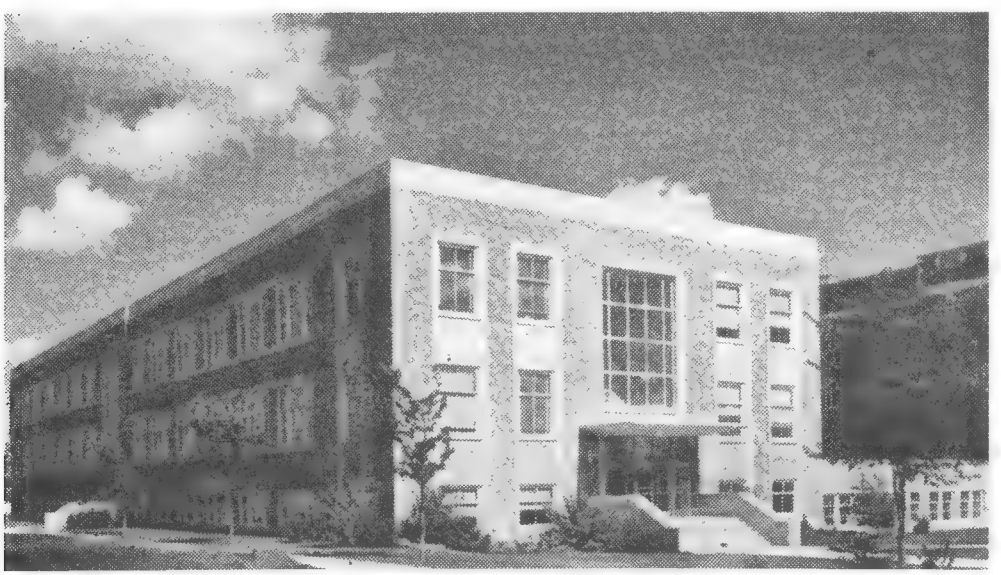
new building on the campus in the 25 year span was erected. It has an ornate structure with vaulted ceilings and no provision for ventilation.

Plans for the Civil Engineering building were completed by the architectural firm of Rule, Wynn and Rule in 1951 and the building was occupied in 1954. At that period it was generally believed that only a few days of any year required air conditioning. No ventilation, except for windows, was provided. Offices were small and very inadequate, but the low profile three story building provided sorely needed classrooms and laboratory space. The drafting lab was transferred from the old Air Force canteen into a well-lit, efficiently-laid-out laboratory on the third floor,

and with minor revisions, has served the needs of the Faculty for over 35 years. There is no doubt that at the time of its opening the concrete, soils, strength of materials and fluid mechanics laboratories were as modern and as well equipped as any on the continent. After existing in the crowded, cramped quarters of the south lab, the building was a palace.

Space at the southern end and the corridor linking it to the west wing of the Med Building was occupied by chemical and petroleum engineering. Adjacent to the rear-loading ramp, a mini oil-well was drilled so that students could have a hands-on experience with oil-well equipment.

Within a few years, the "sheep sheds" that housed the carpentry shops, building services offices and the mechanical engineering laboratories were torn down and replaced with a five-story building that connected to the north end of the civil engineering building. When completed in 1961 the first three floors and basement were occupied by electrical engineering. When George Walker arrived in 1964, the electrical department's need for additional space rose exponentially. Their rapidly expanding graduate teaching and research program filled the entire wing. Space problems continue to plague the Department; promises have been made that a new building in the vicinity of the Mechanical and Chemical Engineering buildings is now a top priority. Retrenchment, which resulted from the economic conditions of the mid 80's has postponed the project. We trust it will not be like the promise made in 1930, indicating a new building for Applied Science which did not materialize for another 20 years.



The Engineering Building
Postwar Developments

The students who swarmed the University immediately following World War II became the graduating classes of '49 and '50. They were very mature; most had spent from three to five years overseas, many were officers accustomed to making difficult decisions. All had given up 15 to 20 per cent of their lives to war service, and all were ready to get an education they could put to use. They were eager to regain those years lost to the war. Never had the classes been so filled with students who worked as steadily and as hard as those veterans. Although their ranks did not

seem to contain the exceptionally brilliant student that comes forth in the regular civilian class, they did contain a much larger percentage of honour students than any of the prewar classes. They were truly a well disciplined group and were fully supported by their wives who, many believed, had a rougher go than their student husbands. It was oft said that the wives were the ones who should have received the degree.

Those hectic years in overcrowded, ill-equipped classrooms produced graduates who were inventive, ingenious, hard-driving, and above all, hungry. They were outward- and upward-bound and went on to occupy responsible positions in the business world. First as fledgling engineers, then as managers and then from presidents of small Alberta firms to heads of giant corporations. Some became millionaires, others went broke, a few chose academic life, but all went on to make a positive contribution to the industrial development of Alberta and Canada. The development of Alberta's vast oil industry is due, in large part, to their efforts. Their education was highly structured, free of options, very basic and without computers. True, there were the standard six-place log tables and one volume of "Vega" eight-place log tables and ten-inch slide-rules. The Faculty owned the computer of that age, a 30-foot spiral slide rule which gave five figures at the low end and four at the upper end but it took a hefty pair of arms to muscle it about. In those days, chips were eaten or anted-up, and capsules were swallowed by man, not man by capsules. The no-frill, hard-nosed diet of basic knowledge laced with countless hours of homework prepared the men and a few women for the challenges of the fifties and sixties and into their retirement decade of the eighties. Many hold responsible positions in industry and government. Their educational experience of the late forties and early fifties has blinded them to the needs of an expanding modern University. They have trouble understanding why classes should be so small, why equipment need be so elaborate, and why research should demand so much of the productive time of the instructors. Many cannot understand why a University cannot survive on government grants alone, and that they must actively support their University with meaningful donations. Without the financial help from the industrial complex and from distinguished alumni a modern university cannot achieve its goal of excellence.

After the veterans moved through the system to graduation the peak enrolment of 960 in the 1947-48 session fell to less than half of that (460) in 1951-52. When black gold gushed from the earth in 1947, the demand for engineers soared. The excellent opportunities in industry offered attractions that could not be matched by graduate research positions. As a result, graduate student numbers declined and the research efforts of the staff suffered.

The 1952-53 session saw an increase of ten per cent in undergraduate enrolment to 504. Ivo G. Dalla Lana and Peter M. Dranchuk were appointed as sessional instructors in chemical and petroleum engineering respectively. They still provide yeoman service in their respective disciplines. The opportunities within the expanding industrial sector of Alberta were most attractive and challenging to members of staff. Many junior staff accepted such positions as did on occasion, senior staff as well.

The demand for engineers grew. The University and the Faculty responded; 621 were admitted in the fall of '53, 720 in '54, 835 in '55 and on in leaps and bounds to 1,134 in '57; 55 of whom were registered in first year in Calgary. Engineering now constituted fully 20 per cent of the University enrolment. We were bulging at the

seams once more.

Professor Morrison and Professor Clark retired in 1954. The original appointments to the Faculty were gone, the second generation was now in command. The direction of the Faculty was changing to match the changes taking place in our province. A Canadian petroleum industry, centred in Alberta, was developing. The promise of a reliable source of cheap, efficient fuel brought new petrochemical industries and their allied industries came with them. A metallurgical industry was established with the opening of the Sherritt Gordon nickel refinery in Fort Saskatchewan in 1954 and the opening of the Premier Steel Mill in 1956. The Faculty responded by establishing a degree program in metallurgy that same year. A dynamic, talented young graduate of Leeds University, James Gordon Parr was recruited in 1955. Additional recruiting increased the staff to four, Walter Lilge and Jan Leja in mineral processing and extractive metallurgy plus Jim Parr and Bill Youdelis in physical metallurgy. During the next ten years the program flourished particularly at the graduate level. Their first Ph.D. degree was awarded to George Poling in 1963. Many of the graduates of that era in metallurgical engineering are members of staff at universities throughout Canada. The group was not a cohesive one and when Parr was offered the position of Dean of Engineering at Windsor in 1963 he accepted. A year later he was joined by Youdelis. Leja was granted a sabbatical leave for the 1964-65 session. He resigned after his sabbatical, to accept a position with the University of British Columbia. The late sixties became a period of rebuilding as new staff were engaged and research programs re-established.

J.G. Parr

The hectic, hurly-burly of the late forties and early fifties gave way to the quiet but steady expansion years of the late fifties with many adjustments in program and staff being made along the way. Frank Hastie and Lee Scott resigned in the summer of 1955. In the fall of '56 John Duby, an honours graduate in Chemical Engineering and the second Rhodes Scholar from the Faculty returned to be appointed a sessional lecturer in mechanical engineering. In 1957, Dr. Donald L. Flock was appointed to replace Jack Gregg in petroleum engineering. Ralph McManus resigned to devote full time to his expanding consulting practice and the first year program was offered in Calgary.

On January 30, 1958; Dean Hardy, at the urging of the Association of Professional Engineers, set up a committee to report on the steps that had to be taken with the view to establishing a degree program in Mechanical Engineering. The committee reported positively to the Engineering Faculty Council on St. Patricks Day, 1958. Everyone was green with envy when they recommended that a program commence in September with an intake of students to third year. I was named Head of the Department and the big round-up began. All the staff of applied mechanics in Civil Engineering - John Duby, Stew Kennedy, myself - and those designated as mechanical engineering staff in the electrical department - Jim Haddow, Eric Johnson, Dave Panar, Chris Rodkiewicz, and Gerry Sadler - became the nucleus of the new department. Allen Doige and Bob Hebbert were added in 1959.

In the fall of 1958 the new program started off with little equipment, no space, very few funds and 21 students. There was no official sanction from General Faculties Council. It was a gamble, but a gamble that paid off.

Bob Hardy resigned the deanship in May 1959 to devote full time to his consulting practice; he remained on staff as a part-time research professor. Under his guidance Alberta had grown to become the third largest engineering school in Canada with a full time staff of 44 in Edmonton, two in Calgary and 40 sessional

instructors, a far cry from the Faculty he took over in 1947. George Govier succeeded Bob as Dean, Don Robinson was appointed Head of the Department of Chemical Engineering and Stew Sinclair was named Head of Civil Engineering. Civil dropped municipal from its title to become the Department of Civil Engineering in 1959.

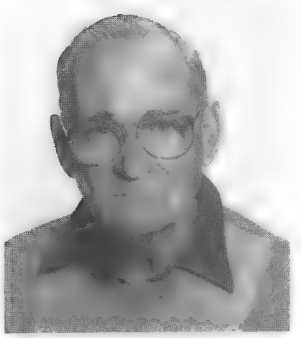
Govier assumed command! Soon (1960-61) he, together with the department heads, drew up "A Long Term Development Plan, 1961-1980, for the Faculty on Edmonton and Calgary Campuses." Student registration, staff and space requirements were projected. It was recommended that a tract of some fifteen acres in the northwest corner of the campus be designated and reserved for the Engineering Centre. A systematic development of the centre to be completed in stages was outlined. It was one of the first comprehensive Faculty plans presented to the administration and alerted the entire University to the need for long range development plans in all sectors. The Govier concept for the Engineering Centre, although changed in some details, remains valid today.

The registration projections were somewhat high, but in 1960 no one dreamt that a quota system would be in effect. The forecast for 1980 was 2,178 undergraduates in Edmonton and 1,409 in Calgary for a total of 3,587. The actual numbers were 1,715 in Edmonton and 1,187 in Calgary for a total of 2,902. Graduate student registration is more difficult to predict but the report suggested that there would be 392 graduate students registered in Edmonton and 185 in Calgary. The actual numbers were 238 in Edmonton and 161 in Calgary.

For the Calgary campus, a ten-acre site was recommended with provision for a stage-wise completion of four buildings; civil engineering to be completed by 1963, with the completion of buildings for Chemical, Electrical and Mechanical Engineering by 1968. The forecast for the Calgary campus seems to have been more successful than that of Edmonton. Their complex is reasonably complete. Edmonton waits for the civil and electrical wings to be moved to the centre.

The plan also envisaged third year, fourth year and graduate studies in Chemical, Civil, Electrical and Mechanical Engineering being offered in Calgary in 1967 and 1968. As a matter of record the first engineering graduates from the University of Calgary missed the forecast date by one year. Their first B.Sc. degrees in engineering were granted in 1969. The second year of the engineering program in Calgary was introduced in the 1960-61 session. In 1963, Dr. Adam Neville was appointed chairman of the division of Engineering in Calgary.

The Faculty's first Ph.D. student, R.A. Ritter, (chemical engineering,) graduated in the fall convocation in 1961. The Faculty graduated six Ph.D. students in 1963. Two were in the spring convocation, Stan Thomson in civil and George Poling in metallurgy. Four were in the fall convocation held in Calgary: Ralph Ansley in civil, Don Bellow in mechanical, and Ron Brown and Mike Charles in chemical.



G.B. Walker

Jim Harle retired as Head of the Department of Electrical Engineering in 1964. His successor, Dr. George B. Walker was born in Scotland and received his master's degree in 1940 from the University of Glasgow and his Ph.D. in 1950 from London University. He had a distinguished teaching career at the universities of Sheffield, London and British Columbia. Under Walker's energetic and forceful leadership the staff in Electrical Engineering more than doubled. Almost every aspect of electrical engineering was taught at the undergraduate and graduate level. The traditional areas of power control and electronics were augmented by a new emphasis on plasma and laser physics. These new areas were to become a dominant force in the research activities of the Department. During his ten years as Chairman his dynamic

leadership attracted young talented professionals who soon established a national reputation for the Department. On the home front he was always eager to explore new territory. He established the ground work for many of the institutes now centred in the Department and was one of the leaders in establishing an Industrial Research Park in southeast Edmonton. Throughout that decade the department grew in size and strength to become one of Canada's leading centres in Electrical Engineering education.

Mrs. Vivienne Joan Harwood was the first woman appointed to the professorial ranks of the Faculty. Mrs. Harwood was appointed as a Sessional Lecturer in the Department of Electrical Engineering in September, 1964. Her field of specialization was high vacuum technology. On May 1, 1965, Mrs. Harwood was appointed Research Associate and on April 1, 1966, Assistant Professor. During her short stay she developed an outstanding high vacuum laboratory. An outline of her graduate course in high vacua, which was unique in Canada, was presented at the 12th Vacuum Symposium of the American Vacuum Society in New York in September, 1965. As a result, their Education Committee adopted her outline as a model to be followed. Unfortunately for Alberta, Mrs. Harwood's stay with the Faculty was a a short one. She resigned early in 1967, to accompany her husband to British Columbia.

The 1967-68 academic year saw the opening of the first major building of the proposed Engineering centre. The departments of Chemical and Petroleum Engineering and Mining and Metallurgy moved into their permanent quarters. Mechanical Engineering, which in the first decade of its existence became the second largest in Canada, had acquired a corresponding increase in complicated and sophisticated equipment. Their space needs were partially met when they occupied temporary space in the new building.

The trend of increasing enrolment continued with a first year intake nearly double that of 1963. The growth was particularly significant since the engineering program at the University of Calgary had expanded to degree granting status in four departmental areas. (Chemical, Civil, Electrical and Mechanical). They would, by and large, provide for the needs of students living in the province from Red Deer south.

The retirement of Walter Johns and the appointment of Max Wyman as his successor in 1969 marked the beginning of a major change that was taking place in the University. During the ten years of Johns' presidency, the University grew from an institution that had in 1958-59 about 5,000 full-time students, 400 academic staff, 800 non-academic staff, and an operational budget of $6-million to one that had 15,000 full-time students, 1,300 academic staff, 2,400 non-academic staff and a budget of $45-million. The physical plant had expanded from 97,000 m^2 to 355,000 m^2. While staff, students and space just about tripled in size, the operating budget increased eight-fold. This accomplishment reflects the transformation of the University from a largely undergraduate college to a University in which graduate study and research began to play a major role.

Without warning and without any apparent reason, an increase in student enrolment, which had been occurring at a rate of ten to fifteen per cent over the past five years slowed to six per cent in 1970-71. Student registration was 18,300 instead of the anticipated 19,500. The unexpected drop was reflected in the provincial grant which was based on student enrolment. Hard times fell upon the University. Positions, normally available through retirement and resignation, were discontin-

ued; budgets, for a decade always increasing, were slashed and a general gloom fell across the entire University. Dean Hardy, who had served the Faculty and the University for over 40 years retired on July 31, 1971. Three Faculty members, Blench, Gads, and Lilge retired at the same time. Replacements were not permitted! To make matters worse the budget was severely cut. It was amidst this turmoil that I succeeded Bob Hardy as Dean.

G. Ford

I was born in Pocahontas, Alberta; when I was three years old we moved to the mining hamlet of Cadomin, I received my early education there and at Victoria High School in Edmonton. I graduated with high distinction in Civil Engineering from the University of Alberta in 1942, receiving the Association of Professional Engineer's Prize. I was awarded my Master's of Science degree in 1946. I received my Ph.D. in Mechanical Engineering from Stanford in 1948. I began my long career at the University of Alberta in 1942 as a Sessional Lecturer in the Department of Civil Engineering, progressing through the ranks to a professorship in 1957. In 1949 I was appointed Secretary of the Department of Civil Engineering, I held this position until 1959 when I was appointed Head of the newly established Department of Mechanical Engineering.

I'd like to digress and relate a couple of amusing incidents that occurred while establishing Mechanical Engineering at the University. Our beginnings were humble: no program, no lecture rooms, no labs, and no money. We succeeded; we changed the rules and improvised. Our offices were scattered through the Departments of Civil and Electrical Engineering. Traditionally, Mechanical Engineering emphasized the thermosciences. Our expertise was thin in this area so we shifted our emphasis from machine shop practice to metallurgy, from heating and ventilating to fluid mechanics and heat transfer. Applied mechanics took on a prominent role and from that basis evolved one of the most dynamic mechanical engineering programs in Canada. Within the next five years machine shop practice disappeared from programs in mechanical engineering. Adversity had its reward. A limited budget forced us into new directions; and young, eager, and dynamic staff compensated for the lack of funds.

We inherited a Keith Fan, a one-cylinder diesel engine, and a viscosimeter that seized and whipped around almost killing the operator every time it was used. We accepted all gifts, the good and the bad, and fixed them for our needs. Thank goodness for the war surplus and Miss Bidgood in Ottawa! She sent out endless lists of surplus material on which we made blind bids. How thankful we were when Miss Bidgood wired back "Received your bid. Raise it to $25.00 and it's yours." We got carloads of useful junk to make more equipment. Sometimes we were burned and burned badly. Once we wanted to get three fast-acting cameras so we went all out and bid $35.00. We got them but they did not have lenses. Screams could be heard all the way to Ottawa!

We were convinced that our first class of 21 mechanical engineering students was exceptional. One Monday morning in February, 1960, I walked into my eight o'clock lecture. They were all there, they always were, it was too easy to be missed in a crowd of 21. Books were piled high in the front of the room and from the top flew a white flag, and there was a message on the blackboard - WE SURRENDER! Their message was clear; we had expected too much of them. I listened to their troubles, we relaxed a little, and 19 out of the 21 became the first of many successful graduates from the Department of Mechanical Engineering.

The program mushroomed and so did the hunt for staff. We were extremely

George Ford - Watson Lake Sign Post 1943, Alaska Highway

fortunate in acquiring a compatible staff who enjoyed working together. They brought with them diverse skills which were woven into the courses. Our program was constantly changed to reflect the presence of the new young staff who radiated enthusiasm. The old guard watched over their shoulders and shuddered at the changes they made. They were breathing a new life and spirit into the Department.

As we grew in size our program matured and we were allotted more funds. Our funding was increased through our research and contractural efforts, as well. We took on an aura of affluence. We could now boil water in many diverse and fancy ways, we acquired wind and water tunnels with hot and cold running fluids, we

obtained instruments and gadgets that screeched all levels of noise which we then measured. But during this period of growth and change many sacrifices were made; applied mechanics assumed a lesser role.

Like the prophets of old we existed in the desert and wilderness of the campus, wandering from building to building and shack to shack always in search of a home, a place to set down our equipment. First we lived in the Power Plant down with the steam boilers and the cracked smoke stack - we had our labs in the sheep shed - and then we set ourselves up in the South Power Plant (half the campus still doesn't know where that is, and doesn't care). Finally we moved north into the new Chemical/Mineral basement which like the bowels of the earth never saw the sunshine. The struggle to equip the early labs was most taxing; funds were so scarce that only $2,000 was allotted to us in 1959. As the power requirements for the expanding University rose so did the necessity of power producing equipment. By stealth and guile we acquired equipment. Budget preparation became a game of wits; we had to specify every piece of equipment and price it down to the last dime. It became a guessing game. How much would we get? How much would be cut back? Every budget had a "white elephant" in it that had to be shot when the budget was announced, so that we could buy the necessities with the leftovers. Our "white elephant" was a portable package steam boiler. We shot that great beast for five years. Then one day the President called and said: "your Department has been trying to buy a steam boiler for the past several years and you have always had to forego it in order to get other much-needed items. I have recognized the seriousness of your case and have obtained a special warrant from the Board of Governors to purchase a boiler." All of a sudden we had a "live" white elephant. It is still in use.

The initial struggle was over. We had plenty of students, we were a little richer, and we were beginning to get some reasonable equipment. We had our first Ph.D. student (Don Bellow). The problem we took in hand was to determine when a beam became a plate or vice versa (it related to the fundamental frequency of vibration in wing sections of an airplane.) A device was required to read and record the output of a hundred or so strain gauges in a few seconds. While visiting a high-tech establishment in the eastern United States, a wide-carriage-typewriter with no secretary was seen busily recording data in tabular form without making any recording errors. It was just the thing we needed! The serial number was recorded and a picture snapped; on return, an order was placed. A week, two weeks passed (the mail was fast in those days) and back came the answer... there was no such machine! We phoned, repeated the serial number and told them we'd send along a picture. The head honcho in Toronto assured us no such machine existed, this slowed down the progress of our student.

One day we were visited by two clean cut young men. They were nattily dressed, one with a crew cut, pin-striped suit, narrow tie, about five-foot-eight; the other man was taller, in a blue jacket, grey flannels and a nice tie. They were greeted with "IBM didn't need to send out a representative for details. We would gladly have told you all you wanted to know over the phone." The man in the pin-striped suit snapped "We are not from IBM." While saying this he whipped out his calling card, a shiny badge with screaming eagles all over it - the FBI. The clean cut kid showed his - the RCMP. What a mess! They wanted to know where we had peeked at the machine and how we had managed to get a close-up photograph. Countless questions poured forth, some relevant, some not. Finally we were told we had violated something or someone and we were in big trouble. After getting the

information they wanted the FBI man said, "I'll report this to my people," and the tall, good looking RCMP said, "Be careful where you take your pictures." Within a week we had a letter from IBM in the USA saying we could have a machine which would come via their Canadian connections. We got our first robot which now gathers dust in one of our labs. This delayed Don Bellow's graduation for a few months. He completed his Ph.D. for fall convocation instead of the spring.

By the late sixties we had the students, the staff and most of the equipment; all that was needed was a home of our own. The administration permitted us to plan a building, but we were fourth on the list behind Chemistry, Law and Fine Arts. We knew what we wanted (windows, no basement) and we had everything in hand including the architect and the design engineers. We put one of our staff (Don Bellow) to ride herd on the planning. We were well on the way while the others were trying to compute their needed space. We built a spacious, inviting building that taught engineering as you walked through it. In getting what we wanted we broke most of the rules. By breaking the rules and coming up with creative ideas we were able to show what good engineering was all about.

In 1971, I succeeded Bob Hardy as Dean; and returned to full time teaching in 1976. While at the University, I sat on numerous committees both as chairman and member: the Campus Development Committee, University Planning, General Faculties Council, General Salaries and Promotions, Salary Committee of the Association of the Academic Staff of University of Alberta, Committee on Higher Education and the Universities Coordinating Council. I have worked on a number of special committees, generally related to engineering education: the Saskatchewan Engineering Review Committee, Advisory Committee to the Commission to Study the Rationalization of University Research, the National Research Council Review Committee on Engineering Laboratories, and as an engineering education consultant to the University of Baluchistan (Iran), the Bangladesh University of Engineering and Technology, and Simon Fraser University.

I sat on National Research Council committees as Chairman and as a member for 25 years. They include the Associate Committee on Aeronautical Structures and Materials, Committee on Structural Research, and the Mechanical Engineering Committee for Grants in Aid of Research. For many years I was a member of the Engineering Institute of Canada and during a reorganization in the late 1960's, I was a member of the Steering Committee for the founding of the Canadian Society for Mechanical Engineering. I then served for three years (1968-71) on their National Executive, was Vice-President for the Alberta region and Chairman of the Papers and Program Committee.

I served the Association of Professional Engineers, Geologists and Geophysicists of Alberta on a number of committees, from 1957-1965 as Member of Council, Vice-President and finally, President. I served on the Association's Board of Examiners for 30 years and was its chairman for the last 13 years. I served as a member and chairman of the Canadian Accreditation Board, and on the committee on Examinations Syllabuses, the committee on Foreign Engineering Qualifications and as the leader on several accreditation teams. During the course of my career I have been the recipient of the APEGGA prize in 1942, Standard Oil of California Fellowship 1946-48, a Life Membership in APEGGA 1964, APEGGA Centennial Award 1975, Jubilee Medal 1977, CCPE gold medal 1978, Fellow of the Engineering Institute of Canada 1981, and the L.C. Charlesworth Award in 1981, and became a Fellow of the Canadian Society for Mechanical Engineering in 1988.

My community related activities include the YMCA and in particular their world outreach, the Edmonton and District International Aid Society (Miles for Millions) and on various United Church boards. Now officially retired, I give one or two lectures per term; and I work as a consultant from time to time. I maintain my interest in the linkage program between the Faculty and the Bangladesh University of Engineering and Technology. I am a Director of Alberta Power. When the spirit moves, my wife and I travel, sometimes to eastern Canada, sometimes to Britain or Australia. I am honored to have been chosen by the University to receive an honorary Doctor of Science degree at the special October, 1988 convocation in celebration of the 75th Anniversary of the Faculty of Engineering.

My term as Dean, 1971-1976, can best be characterized as one of fiscal restraint, administrative change, and turmoil. For years the administrative appointments to the post of Dean or Department Head had been without definite term. In keeping with the upsurge of new freedom in thinking and participatory democracy, the administrative structures within the University began to change.

In May 1972, in line with the general thinking of the day, a searching review of the Faculty's executive and administrative structures took place. The final version of the long study was accepted by Faculty in March 1973 and approved without change by the General Faculties Council on April 30. Major changes were made; the officers of the Faculty would no longer serve without definite term. The period of office for a chairman was set at three years and that of the dean for five years. Incumbents could be considered for further terms if they chose to stand. An executive coordinating committee was established to oversee the business of the Faculty. It consisted of the dean as chairman, the chairman of each department, plus three members elected at large. Standing committees for various needs within the Faculty were struck. The new structure, with slight modifications, has worked well for the last 15 years.

The administrative changes were touchy and time consuming; but the budget considerations which were long and protracted were vital. Countless hours were spent marshalling arguments with related statistics to ward off further cuts. It was not a happy time. Reluctantly the Faculty had to consider alternatives that had seemed unthinkable. In order to maintain a first-class program commensurate with the allocation of funds, quotas had to be imposed on the enrolment in each of the departments. Although such a system denies to some extent, the freedom of choice on the part of the student it does permit a Faculty to live within its means.

During this period there was a heavy increase of Asian students enroling in western Canadian universities. British Columbia had provisions within their entrance requirements which permitted them to regulate the intake of these students, but Alberta at that time had, and for that matter still has, an open door policy for the acceptance of visa students together with visa student registration fees that are among the lowest in the western world. Engineering received more than their fair share of these applicants for two reasons. First, a professional degree provided additional basic immigration points which often were sufficient to permit the granting of landed immigrant status. And second, the course work in engineering is such that a fluent command of English is not as essential as it is in other faculties. Regardless of their future occupational desires, they sought admittance to the Faculty of Engineering. Several methods of dealing with this very acute problem were considered. An attempt was made to regulate the intake of students from other countries by setting a quota limiting the number to a fixed percentage of the

preceding first year enrolment (15 per cent of the first year enrolment would be reserved for visa students, with no more than 20 per cent of the quota from any one country). Cries of racism were heard from far and wide. Letters protesting such a regulation, mainly from Hong Kong, were received. General Faculties Council took notice of these outcries and ruled against a quota that could be considered discriminatory. The problem remained; a solution thought to be workable had been denied. A second try, based on academic requirements, was then considered.

An individual seeking a degree from an English speaking university must have an acceptable command of the English language. Many reliable methods of determining the competence of a person in English have been devised. The Faculty chose one commonly referred to as TOEFL (the Test Of English as a Foreign Language) to be the basis for acceptance into the Faculty. A test score, one which was considered easily obtained by an Alberta student who had University entrance qualification, was set. The test was administered by an independent agency (Educational Testing Service, Princeton, New Jersey, U.S.A.) in centres throughout the world. All visa applicants had to include their test score. Soon the volume of successful applications was reduced to manageable size and the problem ceased. Students who did not meet the TOEFL requirements applied elsewhere and soon similar regulations were passed at other institutions. The TOEFL requirement remains in effect today. It is a University problem and is dealt with under the general regulations. All University of Alberta students must pass a writing competency test before being allowed to continue.

The period of 1970-75 was not all toil and trouble. In 1973 the mechanical engineering building was occupied. It was a new building which, as much as possible, did away with the institutional type of construction of long hallways with closed doors. It is considered to be one of the finest engineering buildings in the country. After 15 years of wandering, Mechanical Engineering has a home which gives them great pride.

By 1975, the financial trauma of the early 70's began to ease. However, severe damage had been done. It would take five or more years to restore academic vitality. The operating budget of the University increased from $68-million dollars in 1972-73 to $107-million in 1975-76. The allocations to the faculties increased in like manner, but most of the increase was lost due to inflation. Inflation became the enemy that continuously attacked the coffers. By 1976 the new administrative structure of the Faculty was working well; the controls on student intake were in place and the financial problems were in hand. The Faculty had weathered the storms of the early seventies and a more or less steady state set in.

P. Adams

Dr. Peter F. Adams was appointed Dean in 1976. Peter is a native of Halifax where he attended school and university. He obtained his B.Eng. and M.Eng. degrees from Nova Scotia Technical College in 1958 and 1961 respectively, and received his Ph.D. from Lehigh University in 1966. In 1960 he joined the Department of Civil Engineering as an Assistant Professor and rose rapidly through the ranks becoming a Professor in 1971.

Peter Adams is a specialist in the design of steel structures and has been employed in industry with the International Nickel Company and with the Dominion Bridge Company. His research efforts are primarily concerned with the strength and stability of steel members and tall buildings. He is the author of more than 70 publications on these and related subjects. Adams is also the co-author of three major text books used for instruction in structural steel design and has contributed

to five monographs dealing with various aspects of structural stability and steel design. He was the first invited lecturer of the Canadian Society for Civil Engineering and the Canadian Institute of Steel Construction, speaking in ten Canadian cities on the design of multi-story buildings.

Dr. Adams serves his profession well. He is a member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta and has served on several of their committees. He is a Fellow of the Canadian Society for Civil Engineering and served on their editorial board. He is a member of the American Society of Civil Engineers where he served on many of their technical committees relating to stability of steel structures. He is a member of the International Association for Bridge and Structural Engineering, the Structural Stability Research Council, Canadian Standards Association and the International Standards Organization for which he was the Canadian delegate to the ISO meeting on standards for steel buildings held in Tallinn, U.S.S.R. Peter also served on the Board of Directors of the Canadian Welding Bureau. Despite his very active participation in technical matters he never neglected his students. He is a forceful, dynamic lecturer with an excellent rapport with students.

Three very significant events took place while he was Dean. The first was the elevation of the Department of Agricultural Engineering to an accredited engineering program; second was the formation of the Cooperative Engineering Education program in the Faculty and third the establishment of C-FER, the Centre for Frontier Engineering Research.

For the first 30 years of its existence the Department of Agricultural Engineering, which is an integral part of the Faculty of Agriculture, provided service courses to the students in agriculture in three general areas: farm machinery, buildings and power. By the late fifties the Department had expanded to the point where it could offer a specialized degree called Industrial Agriculture. The Department had not reached the point where it was recognized by the engineering profession. Over a period of ten years the staff was enlarged and the curriculum revised to the extent that, in 1971, the graduates of the program could register as engineers-in-training with the Association of Professional Engineers, Geologists and Geophysicists of Alberta, but the program had not received national accreditation. In order to achieve this recognition an agreement was reached wherein the curriculum of the Department would fall under the jurisdiction of the Faculty of Engineering but the administration and financing would remain with the Faculty of Agriculture. This cooperative agreement between the two faculties has worked well, permitting Agricultural Engineering to begin offering a nationally accredited degree in 1983. This happy arrangement gives every promise of remaining in effect for years to come.

The University of Waterloo in Ontario, under the dynamic direction of Dr. Douglas Wright, introduced a Cooperative Education Program in 1957. The student alternates periods of study with periods of paid, discipline-related work experience in cooperating employer organizations. This proved to be a very successful venture and soon Waterloo placed students in industrial firms throughout Canada. Often the placement of their engineering students came into conflict with the university students who sought summer work within the various industries in the provinces. Certainly this was the case in Alberta. Several attempts were made to assist Alberta engineering students with summer employment, but none was successful in overcoming the advantages of the well-established cooperative program at Waterloo. Dean Adams set out to rectify this situation by developing a proposal for a Coop-

erative Education Program in the Faculty. After a slow start with a small group of students in Mechanical Engineering in 1981, the Cooperative Education Program has steadily gained strength. Co-op students now account for about one-quarter of the total enrolment in the Faculty.

During his tenure in the office of Dean, Peter Adams made every effort to link the activities of the Faculty with those of the industrial and business community. Under his direction the humanities and social science portion of the engineering program was revised. He encouraged improvement in the graduate programs and research efforts of the Faculty. Through the establishment of the Faculty Research Award Program he initiated a program for outstanding undergraduate students who are interested, to participate in a staff member's research project. The program was an immediate success and has produced excellent candidates for graduate work. This keen interest in research, together with his intimate knowledge of the problems of industry, led him to propose a major research centre related to Arctic and offshore structures and materials. The proposal came to fruition as C-FER, the Centre for Frontier Engineering Research.

The Centre is an incorporated, non-profit research institute of the University of Alberta established in 1983, with major funding coming from the Devonian Group of Charitable Foundations, the Governments of Alberta and Canada, the University of Alberta and the private sector. Its mandate is to address those problems specifically related to materials, design and construction of facilities used in the development of Canada's petroleum resources on both the geographical frontiers of the Arctic and offshore, and on the technological frontiers of conventional, heavy oil and oil sands operations. Research is focussed on two major problems; offshore structures and downhole tubular systems. In addition to research, C-FER is committed to a network program designed to facilitate the transfer of current technical information through industry, governments and universities.

On March 31, 1984, Dean Adams resigned to become president of C-FER. At that time, the selection committee appointed to nominate a replacement for the dean had not completed its task. I was asked to fill in as Acting Dean for a few weeks. Like most estimates, be they time or money, the period of my tenure as Acting Dean stretched on for a number of months.

It was an enjoyable interlude. The reorganization of the administrative structure of the Cooperative Education Program was carried out. Dr. K.C. Porteous, with the rank of Associate Dean, was appointed to direct the program and to ensure that a close relationship was maintained between Cooperative Education and the traditional programs. The success of the venture can be measured by the excellent response; fully a quarter of the students enrol in the program.

Shortly after my appointment as Acting Dean, a request was received from CIDA (Canadian International Development Agency) seeking the assistance of the Faculty in upgrading the engineering program at BUET, Bangledesh University of Engineering and Technology. I reviewed the facilities and staffing of BUET and reported favorably on the establishment of a linkage program between the two universities. Although it has since taken more than two years to get off the ground a $4.25 million assistance program with emphasis on energy and water resources is well underway.

On January 1, 1985, Dr. F.D. (Fred) Otto was appointed Dean. He was born in Hardisty, Alberta and received his elementary and high school education in Mannville. Fred Otto graduated with distinction in Chemical Engineering from the

University of Alberta in 1957, receiving the APEGGA medal. Fred went on to graduate work receiving his master's degree from Alberta in 1959 and his Ph.D. from the University of Michigan in 1963. Otto joined the Department of Chemical Engineering as an Assistant Professor and rose to the rank of Professor in 1970. He served two years as Acting Chairman from 1970 to 1973 and as Chairman from 1975 until his appointment as Dean of Engineering on January 1, 1985.

F.D. Otto, Dean

Fred is a very effective teacher who has always emphasized the importance of high-quality instruction. It is his contention that well-equipped laboratories are a necessary part of a high-calibre undergraduate program. During his 25 years with the Department of Chemical Engineering he has taught courses in mass transfer, air pollution, material and energy balances, and reactor design. His research efforts cover a wide spectrum: vapor-equilibrium for a variety of systems for the natural gas industries, problems in heavy water production, modelling of distillation and absorption columns, and thermal and catalytic upgrading of heavy oils.

In spite of his heavy commitment to teaching, research and administrative duties at the University, Fred has scheduled his time so as to make significant contributions to his professional and technical associations. He has served on a number of committees of APEGGA and is currently a member of its council. For many years he has served on the Board of Examiners and for the past five years has acted as chairman. He has always been an active member of the Canadian Society for Chemical Engineering at both the local and national levels and served as the national President of the Society in 1986-87. He was elected a Fellow of the Chemical Institute of Canada in 1975. Fred Otto has devoted 25 years to the Faculty of Engineering. The Faculty has been fortunate in the selection of its seventh Dean. Fred's exceptional qualities of leadership have been a cohesive force.

The Faculty was established 75 years ago with 69 students, five of whom were in their final year. The Sons of Martha were five in number, one professor and four junior instructors. Today, the great grandsons of Martha number more than 130. In their care are some 2,000 undergraduate students as well as 300 full-time and 75 part-time graduate students.

Academic Staff
Chemical Engineering

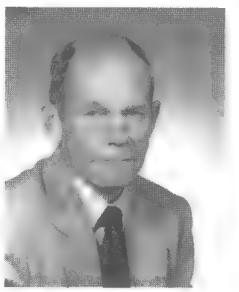
Left to right:
F.D. Otto, Dean,
K.C. Porteous, Assoc. Dean,
K.T. Chuang,
P.J. Crickmore




I.G. Dalla Lana
D.G. Fisher
M.R. Gray
R.E. Hayes




D.T. Lynch
J.H. Masliyah
A.E. Mather
W.K. Nader

K. Nandakumar
J.T. Ryan
F.A. Seyer
S.L. Shah


S.E. Wanke, Chairman
R.K. Wood

Civil Engineering

P.F. Adams

K.O. Anderson

J.J. Bakker

D.H.-J. Chan

J.-J. Cheng

D.M. Cruden

S.P. Dozzi

Z. Eisenstein

A.E. Elwi

G.R. Finch

E.L. Fowler

R. Gerard

S.E. Hrudey

T.M. Hrudey

P. Huck

D.J.L. Kennedy

G.L. Kulak
J.G. MacGregor, Chairman
N.R. Morgenstern
D.W. Murray

A.E. Peterson
A.W. Peterson
N. Rajaratnam
J.D. Scott

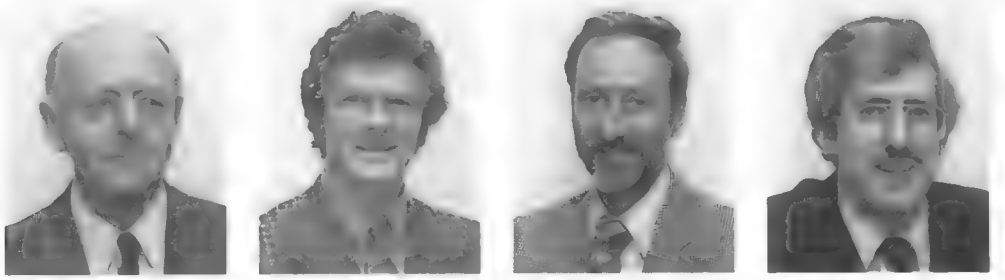
D.C. Sego
S.H. Simmonds
D.W. Smith
P.M. Steffler

S. Teply
J.P. Verschuren
J. Warwaruk
G.T. Wormsbecker

W.A. Weir

Electrical Engineering

C.E. Capjack, Assoc. Dean
H.P. Baltes
K.E. Bollinger
M.J. Brett



G.S. Christensen
F.S. Chute
G.D. Cormack
N.G. Durdle

C.G. Englefield
R. Fedosejevs
I. Filanovsky
E.F. Girczyc

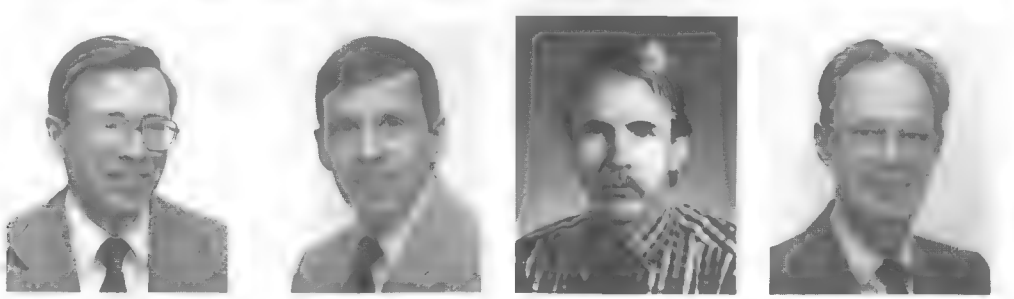
P.A. Goud
V. Gourishankar
P.J.R. Harding
C.R. James

W.B. Joerg
D.H. Kelly
Y.J. Kingma
D.O. Koval

W. Krzymien
R.P.W. Lawson
R.I. MacDonald
J.N. McMullin

J.T. Mowchenko
A.A. Offenberger
R.E. Rink
L. Ristic

D. Routledge
J.C. Salmon
H.J.J. Seguin
P.R. Smy, Chairman



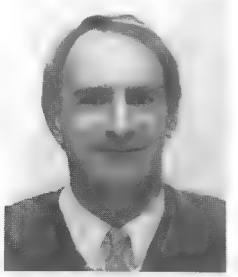
K.A. Stromsmoe
W.R. Tinga
J. Tulip
J.F. Vaneldik


F.E. Vermeulen
W.A.G. Voss

Mechanical Engineering




J.S. Kennedy, Assoc. Dean
D.G. Bellow
D.R. Budney
K.C. Cheng



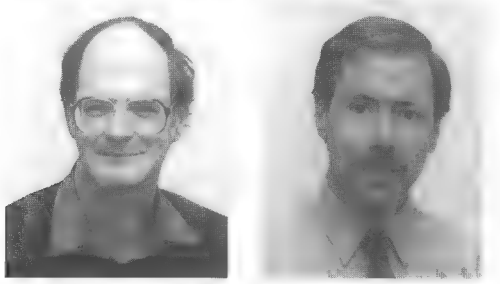

J.R. Colbourne
A. Craggs
J.D. Dale
F. Ellyin




M.G. Faulkner, Chairman
W.H. Finlay
T.W. Forest
J.B. Haddow

A.W. Lipsett
G.S.H. Lock
D.J. Marsden
A. Mioduchowski

G.W. Sadler
J.C. Sprague
R.W. Toogood
R.L. Varty



J.D. Whittaker
D.J. Wilson

Mining, Metallurgical and Petroleum Engineering

K. Barron
R.G. Bentsen
N. Berkowitz
S.A. Bradford

P.M. Dranchuk

N. Egiebor

R.L. Eadie

T.H. Etsell

S.M. Farouq Ali

D.L. Flock

T.S. Golosinski

W.H. Griffin

D.G. Ivey

B.M. Patchett

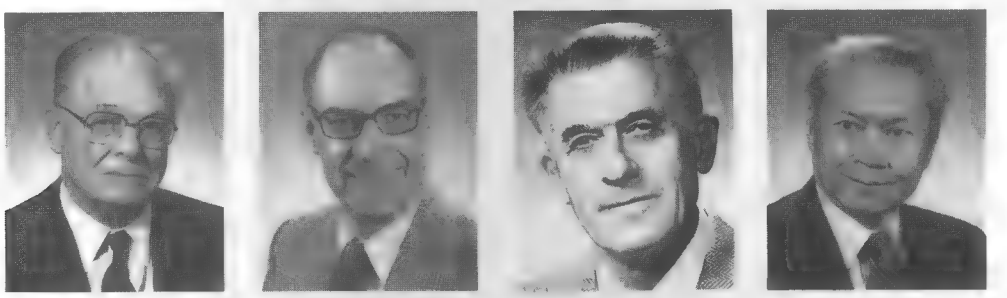
L.R. Plitt

M.L. Wayman

J.M. Whiting, Chairman

Professor Emeriti

T. Blench
P.H. Bouthillier
G. Ford
R. King



E.O. Lilge
J. Longworth
T.H. Patching
D. Quon

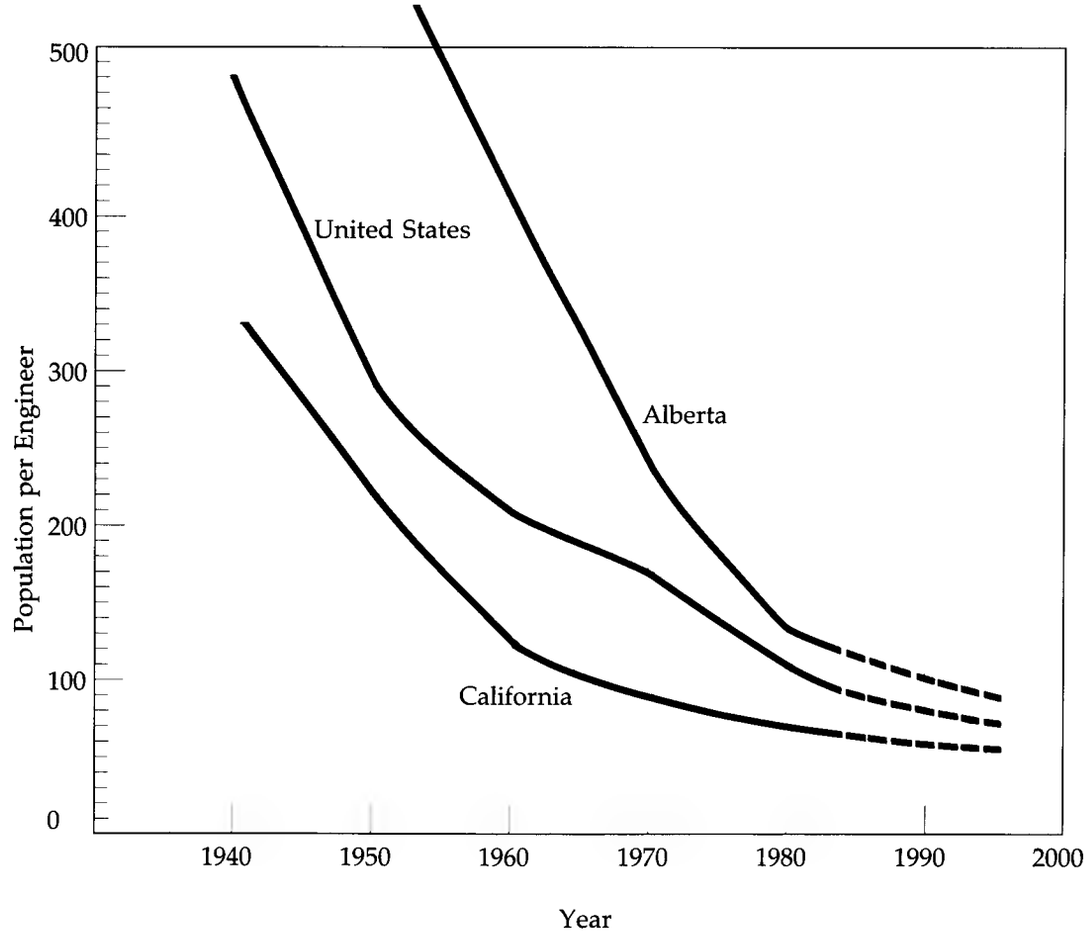
D.B. Robinson
S. Thomson
F.H. Vitovec
G.B. Walker

During the first 25-year period of the Faculty, 413 students obtained their undergraduate degrees, 88 in civil, 133 in electrical, 127 in mining, 60 in chemical and 5 in engineering physics. The second 25 years saw the numbers increase seven-fold to 2,932 with degrees in seven areas, 911 civil, 682 electrical, 294 mining, 623 chemical, 206 petroleum, 102 engineering physics, 7 irrigation, 22 metallurgical and 85 mechanical. Irrigation engineering degrees were awarded for several years. The program in engineering physics ceased in 1966; 20 years later it was reinstated by the Department of Electrical Engineering. During this last 25-year period degree designations have increased to reflect the specialization that has arisen in the departments of electrical and mining engineering. The number of graduating students has more than doubled to 6,619 with 1,655 civil, 1,539 electrical, 192 mining and mineral, 912 chemical, 282 petroleum, 1,664 mechanical, 188 metallurgical, 118 computer, 53 in agricultural engineering and 16 in engineering physics, for a grand total of 9,964, 216 of whom were in the co-op stream.

An interesting observation may be made when the number of registered engineers in the province is compared with the numbers of graduates of the Faculty. The number of professional engineers in the province in 1965 was 4,400 which is

very close to the total number of graduates (4,481). Many of those registered were graduates of other engineering schools, but on balance it appears the Faculty of Engineering had supplied the number of engineers required for the industrial development of the province. By 1975 there were some 8,800 registered engineers in the province, while the number of graduates from both Faculties of Engineering in Calgary and Edmonton was 7,200 for a shortfall of 1,600, by 1980 the shortfall was over 2,500 and today the shortfall is over 5,000.

Graph Comparing Population Per Engineer 1940 to 2000



In 1940, in the pre-industrial age of the province, there was one engineer for every 3,000 of population, by 1950 there was one engineer per 1,000 people and by 1980 there was one engineer for every 120 people in the province. At the beginning of the next century there will be one engineer for every 75 people in the province. It is very unlikely that the Faculty of Engineering at the University of Alberta and the Faculty of Engineering at the University of Calgary will be able to meet this heavy demand.

Chapter 9

Henry Marshall Tory

Henry Marshall Tory was the first President of the University of Alberta and the first Chairman of the Applied Science Faculty Council. He acted as Dean from 1913 until 1921, when R.W. Boyle was appointed. A physicist and a mathematician, his guidance had a profound influence on the Faculty. This chapter comprises a reprint of an article on Tory's Khaki College, printed in the Edmonton Journal, August 30, 1919; and a reprint of a biography on Tory by R.W. Boyle, the first Dean of Engineering, for the New Trail, October 1947. The Edmonton Journal and the Alumni Association of the University have graciously permitted their use.

Henry Marshall Tory
by R.W. Boyle - The New Trail, October, 1947

An old French proverb says, "Ideals without action are a vain mirage," which is not so different from St. James', "....faith, if it hath not works, is dead, being alone." Dr. H.M. Tory throughout his life dispelled all illusion and mirage; idealist always, he based strong actions on underlying, cherished, and closely guarded ideals. His personality was dynamic, with a driving optimism and energy, not sparing even himself; undoubtedly he sprang from the "Celtic fringe" and shared its sacred fire.

The genealogy of the Tory (or Torrey) families of North America is interesting, and too long for inclusion here. It has been compiled in two volumes by Professor F.C. Torrey of an American College.[7] Henry Marshall Tory was born on January 11, 1864, on a farm near Guysboro, N.S., being the great-grandson of James Tory, who had been a soldier of the 71st Scottish Regiment fighting in the American Revolutionary war, and who, after a period as prisoner of war, received at the close of the campaign, a grant of land near Guysboro. Tory's early education was imposed from the outside, the choice of studies depended more on the judgement of the teacher and the aptitude of the pupil. A plenitude of farm work with his studies was seasoned with the usual healthy activities of the country, fishing, sailing, snowshoeing and skating. His family moved into the town of Guysboro about the time his primary schooling was finished and there Tory found his first job, as a clerk in the dry goods store.

Undoubtedly Tory was constantly encouraged toward further education by his mother, daughter of a neighbouring family and a very remarkable woman, and though he clerked for three years, his ambition for further education was not

[7] The Torrey Families and their Children of America, by Frederic Crosby Torrey, A.M., published privately in Lakehurst, N.J.; Vol. I, 1924; Vol. II, 1929.

dimmed. He attended Guysboro Academy, then spent two years teaching in nearby rural schools, thus entering a profession which he followed all his life, and acquiring experience that probably whetted his desire for college and higher training.

At this stage occurred one of the most fortunate events of Tory's life, viz., a meeting with Sir William Dawson, then Principal of McGill University. Dawson was a man of strong character and vivid personality, an outstanding geologist; and a meeting with him on one of Dawson's summer trips to Nova Scotia brought Tory to his notice and under his advice and influence; a consequence was that Tory decided for McGill University (his mother had originally wanted him to go to Mt. Allison University for Arts and Theology). At the age of 22 Tory registered for Honours in Mathematics and Physics, and graduated in 1890 with Honours B.A. and gold medal. His record shows him to have been a good student, but not the college bookworm type. In his undergraduate days he was keen and outstanding in the debating society, was an officer in the College Y.M.C.A., leader of a Bible Class in one of the large city churches, and was class orator of his graduating year. When he could he played the athletic games of his youth, and he helped in the formation of the McGill Rifle and the Western Club.

Tory's family influence and his personal bent for religious thought and endeavour remained strong throughout his college career, and after graduating he continued his study of theology at the Wesleyan College, Montreal, affiliated with McGill. In due course he received the B.D. degree, and undertook a preaching charge in a city church for two years. However, he returned to his mathematics and physics studies and teaching, became a Lecturer in Mathematics at McGill in 1893, and took the M.A. degree (Mathematics) in 1896. To assist in the new Department of Physics, housed in the elaborate new Macdonald Physics Building, he spent two terms at the Cavendish Laboratory, Cambridge University, England, where the celebrated J.J. Thomson was then Professor. This experience enabled Tory to help Professor Hugh Callender, first Macdonald Research Professor of Physics at McGill, and Professor John Cox, Macdonald Professor and Director of the Physics Building, in the installation of extensive equipment and organization of laboratory courses. He became Demonstrator of Physics while continuing to lecture in Mathematics, and received the D.Sc. degree in 1903. He was promoted to the Associate Professorship of Mathematics in the same year.

In that year, 1893, at 29 years of age, he married Annie Gertrude Frost of Knowlton, Quebec. This union was a very happy one; there were no children, but the Tory home ever extended a bright and warm hospitality to colleagues of the McGill staff and many of the students. Later in his career when Tory became President of the University of Alberta, Mrs. Tory played the part of the ideal hostess, the President's house becoming a centre, for staff and many students, of stimulating social and cultural enjoyment. In Ottawa again the President's house was a cheerful and intellectual centre for many of the N.R.C. staff and visitors from almost everywhere. The happy union of Dr. and Mrs. Tory lasted until her death in 1938.

In Tory's student and early McGill staff years he was undoubtedly inspired and influenced by three of the outstanding personalities of McGill of that day. We have already mentioned Dawson, the Principal, who remained Tory's firm friend until Dawson's death; there was Clark Murray, Professor of Moral Philosophy, who taught Tory his formal philosophy and no doubt fed fuel to a philosophical flair within him; and also Alexander ("Pat") Johnson, Professor of Mathematics and Dean of the Arts Faculty, a "wise and witty Irishman" from Trinity College, Dublin.

And another fine friendship of Tory's should be cited, beginning in 1898; in that year Callender resigned from the Research Professorship of Physics to go to the Imperial College, London, and young man of twenty-eight, Ernest Rutherford from New Zealand and the Cavendish Laboratory, was appointed in his place. This young man laid the foundation of a great research career in his nine years at McGill, and later in England became the celebrated Lord Rutherford, Nobel prizeman, propounder of the Nuclear Theory of the Atoms of Matter, and originator of all subsequent work on Atomic Disruption, which led to the atomic bomb. Tory, six years his senior, and Rutherford were compatible, helped one another and became close friends, and maintained this friendship throughout their lives, though their careers were cast very far apart.

At the beginning of this century Tory was officially Associate Professor of Mathematics in the McGill Faculty of Arts, but in addition he played a great part as unofficial adviser to Dean Johnson on student affairs, and was really, though not so named, sub- or assistant-Dean. When "Pat" was succeeded in the Deanship by Dr. Charles Moyse, Tory continued the same role, and as a result became a sort of special ambassador of McGill throughout Canada. He possessed the special talents of a wise and friendly diplomat, together with the human quality and astuteness to comprehend basic factors governing the evolution of institutions and events. At this time McGill was considering the establishment of branch junior colleges in Canada and Newfoundland; Tory was dispatched on missions to appraise the possibilities and where necessary, conduct negotiations; the McGill University College of British Columbia was established in 1906 as a direct result of his mission. This college functioned as a branch college of McGill until May 1915, when it was absorbed in the newly created University of British Columbia.

In 1905 the Provinces of Saskatchewan and Alberta were carved out of the Northwest Territories by the Federal administration of Sir Wilfred Laurier, and the provincial governments so formed decided to establish their own universities. In 1907 the first Alberta Government founded its university and selected Dr. Tory as President. Undoubtedly his success in British Columbia and the contacts and knowledge of the West thus acquired, were important factors to prompt this choice. He arrived in Edmonton, in the spring of 1908 and found that a splendid site of 258 acres was suggested for the university, on the south bank of the Saskatchewan River, in the western section of the town of Strathcona, across the river from the capital. His task was to erect a modern university in this wheat field and bush. "He had to buy a farm and people it with colleges!" An interesting picture of the early days and of Tory's enthusiasm is given by Dr. E.K. Broadus, the first Professor of English. "In June 1908, the President of a University not yet in being, in a Province I had never heard of, in a country I have never visited, came to Harvard and offered me the Professorship of English. The offer sounded like midsummer Madness! I think that what I accepted was not the position or the salary, but the man!.... In September of that year I found him ensconced in the attic of a small brick public school building. There assembled the four of us. We were to constitute the Faculty, veritable 'philosophes sous les touts'; and he, and we, and it, were for the nonce the University of Alberta." Undoubtedly many a young man, professor, lecturer, instructor, demonstrator, came to the new University with the same or kindred thoughts, but all inspired by the enthusiasm of the man who had selected them.

The University opened its doors in September, 1908, with one faculty, 5 professors and 37 students; it gave its first few degrees in May, 1912. When Tory left the

University, May, 1928, it had five faculties with their subsidiary schools, about 1,600 students, working, and some of them residing, in seven or eight modern well equipped buildings. The fine group of structures which will adorn this splendid university site is not yet complete, but Tory saw that a fundamental architectural plan was devised to be followed as the years went by. The student body now numbers over 4,000; its graduates have done well in war and peace; many of them rest "in Flanders Field" and other hallowed places.

Great War I, 1914-1918, was so widespread in its incidence, and so threatening in its consequences, that Tory's ardent spirit could not be satisfied with ordinary university routine duties at home; he was noticeably restless to serve more directly and intensively, and eventually his opportunity came. In 1916 he had been requested to prepare a special report on the discharged men from the army for the National Council of the Y.M.C.A. Undoubtedly this report was a prime reason for the later invitation to draw up a plan and organize regular study courses for Canadian soldiers in England. On this plan (1917) was founded an Educational Section of the Army, unique in its purposes, later known as the "Khaki College." In January 1918 Tory arrived in England to be President of this novel enterprise, which became the forerunner of kindred projects for education in the military forces of many nations. The Khaki College was timely, for in the trying, restless, demobilization period of 1918-1919, it aided greatly as a steadying and disciplinary influence to many men besides helping to make up time in their education. This College lasted just less than two years, during which about 50,000 men took courses and about a thousand of them received educational credit for a year of regular college work.

The return to his university position, autumn 1919, was the end of a unique interlude in Tory's career. The war had left a lasting impression upon him of the great value of scientific pursuits in a nation; he became tireless in his advocacy that universities, governments, industrial firms and societies should all realize the great importance of scientific discovery, of practical application of scientific devices, and of general guidance by the scientific method. He convinced the Government of Alberta, and helped them found the Alberta Council of Scientific and Industrial Research, becoming its first Chairman.

Tory assisted the Government of Alberta as consultant in many matters, and was also called on by other provinces and by the Dominion. In 1913 he was the Alberta representative on an American Commission for the Study of Agricultural Credits and travelled on the commission's enquiries throughout Europe. The data assembled became useful again later on Tory's becoming a single Commissioner to advise the Dominion Minister of Finance on the same subject. He was a prime mover in organizing the National Conference of Canadian Universities, and helped to promote the League of Nations Society throughout Canada. In addition he served on the Executive Committee of the British Empire Universities Bureau, the Imperial Education Committee, and the Canadian Commission of Conservation.

A pointed example for all British Dominions was the Act of the British Government, 1915, while Great War I was raging, to found a Council and Department for Scientific and Industrial Research (D.S.I.R.) The Canadian Government followed suit in 1916. For eight years this Council functioned as a Board only, allotting its voted funds to researches in universities and for bursaries and scholarships. It had no established laboratories and its annual vote from the Government had not reached more than $120,000. At an important meeting, the 1st, February 1923, the

council considered what would be necessary to establish a National Research Institute with laboratories, and recommended an expenditure of $600,000 to purchase a site and erect a building. Tory was nominated to be a Council member; two weeks later he was appointed by Order-in-Council, and took his seat at the spring meeting. This appointment was timely and fortunate, for Tory brought to the Council a great experience, with imagination, zeal and vigour.

There was no immediate action by the Government to erect laboratories, and in the face of this disappointment, Tory urged movement, more vigorous still, to demonstrate the advantages of scientific research by attacking some great national problems, the solution of which Canada needed, and he further urged full organization of these researches on a national scale. His influence in the Council was immediate and effective. Dr. Frank Adams, Vice-Principal of McGill, who had been acting as temporary administrative chairman of the Council, decided to follow his personal desire and resign, thus opening the way for Tory to assume direction of the Council's activities. The Council thereupon nominated him as Adams' successor, and he was named temporary Chairman of the Council by Order-in-Council, in October, 1923. Early in 1924 he submitted to the Council the draft of a revised National Research Council Act, which after full discussion by all authorities concerned was passed by Parliament in July of that year. This new act provided authority for enlarged scope of the Council with the establishment of a habitat and central laboratories.

Tory, as Chairman, organized Committees of the Council, with many other specialists serving on them, to attack national problems. Soon there were working committees, supervising researches supported by Council funds, on great subjects important in the national interest, such as wheat rust, other plant diseases, refractories, aeronautics, foods, fuels, tuberculosis (animal and human), and others; and money grants were increased for specific researches in the universities, and for bursaries and scholarships to train young research workers. Senior Directors supported by junior researchers were appointed to the Laboratories' staff which grew gradually, and were organized into the natural divisions of Science; viz., Biology, Chemistry, Engineering and Physics. Tory enlisted support from technical branches of federal and provincial government whenever and wherever their work was related, combining the services of all in cooperative endeavours. In a striking personal effort, he continued throughout the Dominion, as an evangelist of science, the work which he had begun in the west; he made speeches and gave reports to conventions, annual meetings, Canadian and Service clubs, and boards of trade, always promoting the idea that governments, industries and the public generally should liberally support research for their own and the nation's benefit, not only the application of scientific devices but also the employment of scientific method in industrial and public affairs, and not neglecting the social and cultural benefit so derived. Undoubtedly his work aroused and considerably advanced the public opinion. In 1927 the Government of the day decided to establish National Research Laboratories at Ottawa, and later, as from June 1, 1928, appointed Tory to become the first President of the Council and Chief Executive Officer. He came to Ottawa to live in May 1928, then 64 years of age. Immediately under his direction began the planning of the great laboratories, now internationally well known. Contracts for their erection was begun two months later. The main building, an adornment to the national capital, was officially opened as a chief event of the British Commonwealth Conference (the Ottawa Conference) of 1932.

It has often been truly said that it was a stroke of good fortune that at the beginning of the Great Depression (1930-35) there was a man of such amazing energy, great imagination and faith behind an effort to erect a Temple of Science for Canada; and it is probably true that many a man, not necessarily weak, might have lacked the great faith and vigour required in the face of many difficulties, and in consequence have allowed the great task to lapse for many years. These National Research Laboratories at Ottawa and other places have been greatly expanded as a consequence of Great War II; but it can be stressed that it was most fortunate for Canada that they were in operation when war broke out; and the great initiator and founder, who displayed the clearest foresight and vision into the future was H.M. Tory. He served as President of the Council through the harrowing years of the Depression until the expiration of this term in June, 1935. Perhaps it was the Research Council and its Laboratories which drew from him his greatest effort and determination in spite of the great impediments of the period; to him more than to any other man are due the foundations and works of the National Research Council.

While he lived in Ottawa, as in the West, Tory was called upon often for public service, acting on boards and commission of enquiry into various subjects. He was chairman of the Commission on the Fruit Industry of Nova Scotia 1930; organized the Fifth Pacific Science Congress, held in Canada in 1933, and served as its President (he had been a Canadian representative to a previous Congress in Japan in 1926); served on the Coal Classification Committee until 1935; and was a single Royal Commissioner on Coal, in the City of Montreal in 1936. He continued his activity in the League of Nations Society of Canada, serving on its executive and, in 1938, becoming its President. He retained that office for five years, through the trying prewar years and early difficult period of Great War II; later he served as the first Honorary Treasurer of the Canadian Committee on Refugees.

Tory's last years were intended to be spent "in retirement", writing books and essays; but he gave these years to one more new institution of education, namely, Carleton College of Ottawa. This college originated in the idea and discussions of some public spirited Ottawans. Previous to Great War II a committee of Y.W.C.A. members and others had discussed the inadequate facilities for certain types of higher education in the capital, and with the outbreak of the war in 1939 the need grew more acute, because thousands of young men and women, with education interrupted by the war, were coming to the capital to work in the military services, and in the government offices and laboratories. Tory was invited to join a group of men to find means for a practical solution of this important problem, and in 1942 a Board of Governors and a Faculty to give two years of college work were established. Once started Tory never looked back; he was appointed by the Board the first President at age 79, and all his tremendous educational experience, his knowledge, his energy, he gave devotedly and without stint. The college began in borrowed buildings with 35 instructors lecturing in the evening to 700 students, only a few of whom intended to continue their studies to a degree. At the time of Tory's death, February 6th, 1947, the college had 78 instructors, lecturing in day and evening classes to an enrollment of 1,500 students, most of whom were pressing towards a degree. At the present time third year work is offered, the first permanent building has been purchased, and a subscription campaign for funds is in progress to provide for this building with an extension, at an estimated cost of $500,000.

Some of his friends at times wistfully indulge a wish that Dr. Tory had spared a little more time and effort for his autobiography, even at the cost of a little less for

Carleton College. He had planned this autobiography, in fact had begun it, but gave his whole strength to the new college with the result that the autobiography never saw the light. And he had so much to write about, covering the great period of Canadian development which his life spanned. His experience stretched from extreme east through the centre to the extreme west of Canada; he knew virtually all the leaders of governments, education, science, literature, finance and industry over all the country and through three decades; perhaps no other Canadian had the tale to tell which he could have told. This autobiography never saw the light, but Carleton College has risen to remain a last monument to the courage, energy and vision of this indomitable man.

No one who know H.M. Tory could ever forget his sense of humour, his great capacity for amusement and enjoyment, and his innate kindness. Because of this humour and kindness he was all the wiser in his judgement of people and affairs. A sense of humour is a sense of proportion; and being a keen scientific analyst, he was no dogmatist, but saw into men and events with an understanding sympathy which went very far. He was specially gifted with imagination and with unlimited enthusiasm for the good cause which inspired it. His ability in orderly reasoning combined with his judgement of men made him exceptionally able in organization. Very human himself, he loved human companionship; and since he possessed the special faculty of inspiring others, his leadership was always natural and very able and conspicuous.

He had no children of his own, but loved young people everywhere, and it was very appropriate that he lived his long life always in close contact with youth. It is said of some men that "they grow old gracefully"; Tory hardly grew old at all! He was a crusader against anything yielding to the ignoble and the ignorant, and often put passion and emotion in his appeals; but at times he could be very cool and calm; at times could "blaze with indignation", yet when necessary be adept in "the soft answer which turneth away wrath." He had an illustrious career, and while maintaining throughout a just pride and self-esteem remained humble, reserving a quiet amusement tinged perhaps with contempt for the "swelled head" or the "stuffed shirt". He was offered and received many honours, by universities, societies and government; but he declined some.

The character and qualities of H.M. Tory determined what his life and work should be, and Canada offered the opportunities to this great patriot. His country, which he loved passionately, owes him a great debt which only the distant future can properly appraise. He seemed always to be drawn to the initiation of new movements and new institutions, and found thus a greater intellectual and spiritual satisfaction than mere operation of already going concerns. Time and again this writer has heard him exclaim, "I am a pioneer." This is precisely true; and in this pioneering, his life's score, including as it does The McGill College of British Columbia, The University of Alberta, The Khaki College of Great War I, The Scientific and Industrial Research Council of Alberta, The Federal National Research Laboratories, and after "retirement" The Carleton College of Ottawa, constitutes a tremendous monument. We cannot tell what the future will unfold; perhaps posterity will decide that The University of Alberta and the National Research Laboratories were his greatest foundations; but through all the years, it will be agreed by all that the above constitutes veritably an impressive and monumental list.

It is precisely true that H.M. Tory was a man of his times and exactly suited to his period of Canadian history. Teacher, preacher, philosopher, man of action, he

was nevertheless a conspicuous scientist. Without leaving treatises or formal scientific contribution in papers or memoirs on specific researches he was a great missionary and evangelist of research, and contributed greatly to the adaptation of science to his country's needs. Without leaving any formal dissertation of philosophy he was a philosopher of education and without serving in any legislative hall he became Canadian statesman-at-large for both Science and Education. He was Initiator and Organizer of Institutions designed to last for all time; instinctively, as it were, he thus pursued his happiness. All his efforts were fundamental preparations to render fruitful a soil to yield intellectual and spiritual harvest forever.

> His is a life , not of the world apart,
> But of the very fire of Earth itself,
> Hewing new paths in human History,
> Bending the course of History itself."
>
> (W.S. McDonald, Alberta Graduate, Sc. '15).

The Edmonton Journal
Saturday, August 30, 1919
Alberta's War-Time Child

Khaki University a Timely Measure That Canada Established

Great Aid to Soldiers During Stressful Period-Filled Gap In Educational Progress That Was Threatened By Military Activities

By W. Everard Edmonds

No review of education progress, during the past year, would be quite complete without some reference to the Khaki University of Canada which, born on the bloody battlefields of Europe, may yet be regarded as a child of Alberta. When Dr. H.M. Tory, president of our provincial university, visited England and the Western Front in 1917-on the invitation of the Y.M.C.A. and with the consent of the Canadian government-to study the question of education in the army, he was struck by the great number of student soldiers who had suddenly dropped their studies in response to the Empire's urgent call. As an educationist, he realized that these young men, with hearts thrilled by the sound of the bugle, would find it exceedingly difficult to return to their books when the war was over. Could not something therefore be done to bridge the gap between war times and peace, something that would keep these men in touch with their studies during the somewhat trying period of demobilization?

It was also apparent from the first that there was here in the army areas of France and England, an unique and almost unparalleled opportunity of elementary and industrial education among non-university men. Many of the soldiers could barely read and write, and the meaning and significance of education had never been brought home to them. If these men could be interested in national and industrial problems while overseas, the effect would make itself felt at once on their return to Canada. They would give a heartier support to movements for social betterment, and thus leaven the communities in which they lived with a desire for wholesome progress.

University Becomes a Military Organization

With the president of the University of Alberta to think is to act, and it was not long before he had inspired the minds of other leading educationists with his own enthusiasm in the matter. After several conferences a plan was evolved. Permission was obtained from the military authorities to put this plan into effect, and for a considerable time the work was carried on in an unofficial way. In September, 1918, however, an Order-in-Council was passed which gave the movement an official authorization and the Khaki University became a branch of the overseas military forces of Canada with the following officers in control: Director, Col. H.M. Tory; deputy director, Lieut.-Col. Adams; assistant director for France, Lieut.-Col. Oliver; assistant director for England, Major Gill. An establishment of about 240 officers and other ranks composed the instructional staff, a number that was later increased to approximately 800 after the armistice.

The general scheme, as outlined in the original proposals to the demobilization board, was, in the main adhered to, the five departments being as follows: (1) An educational centre for higher work; (2) Elementary and industrial education; (3) The extension department; (4) The attendance of special students at British universities; (5) The library department. During the period of waiting before the final authority was given it was found necessary to assist large numbers of men by means of books and organized courses of study. To meet this a correspondence department was established and placed under the direction of Major Weir.

In France, under the assistant director, the work was divided into four large administrative units: Canadian corps, hospitals, forestry and railway troops. In England, however, the organization was carried out with the individual camps as administrative units, the general plan being to create elementary schools in every small unit in the army, and colleges wherever there was a sufficient concentration to bring men of a more advanced type of education together. In England, the large camps which were capable of holding from 10,000 to 20,000 men formed a sufficiently definite organization in which to place area colleges. Of these, there were in operation in the British Isles nineteen centres in all.

In order to give men who decried higher work proper facilities for study, a concentration camp was set up at Ripon, known as the Canadian Khaki university unit. Here about 700 men took courses in arts, engineering, agriculture, medicine, pharmacy, law and theology. As these courses did not extend beyond the 2nd year, permission was obtained to place a number of men of higher standing at the British universities. About three hundred and fifty men took advantage of this privilege.

The Extension Department

The extension department which acted as a coordinating agency between the various units, was one of the first to be organized. Captain Ottewell was at the head of this department, and associated with him were a number of lecturers who dealt with such matters as reconstruction, cooperation, British empire problems, Canadian history, citizenship, etc. These lecturers worked in both England and France at the various camps. They also visited the hospitals, a special feature being the presentation of lantern slides illustrating the work being done by the invalid soldiers' commission in Canada.

Great difficulty was experienced in getting books in the early days of the movement, but this was largely overcome after the signing of the armistice by the energy and enterprise of Captain Gilmour, who took with him to France fifteen tons

of books and pamphlets, another twenty tons being sent by mail. Over 250,000 books and fully 1,500,000 pamphlets were used, 67,000 books having been imported from Canada and the United States.

Classrooms and Teachers.

Foreseeing difficulty in securing accommodation for teaching purposes in some of the large camps in England, hutments were built, e.g., at Witley and Bramshott. At Seaford and Epsom, suitable buildings were secured on a rental basis. During the period of demobilization, the Y.M.C.A. huts in all the areas were made available for daytime work, and recreation rooms in the lines of the various units were also secured. At Ripon a whole section of the camp was placed at the disposal of the Khaki university.

As to teachers, in the battalion schools these were selected as far as possible from the units, and in France wholly so. For the area colleges, teachers were selected from the various units as required. In the concentration camp at Ripon, the teachers were drawn from the army as a whole, the heads of the departments in every case being experienced university men.

In February last, a new department was formed, the bureau of information, and a central office was established at headquarters with Captain McKean, V.C., in charge. Local bureaux were established at Bramshott, Buxton, London, Rhyl, Ripon, Seaford, Witley and at Le Havre in France. An officer and staff were placed in charge of each bureau. The headquarters in London were in direct communication with the authorities at Ottawa, so that any action decided upon by the government affecting the settlement of soldiers reached the bureau by cable. This information was at once distributed to the several bureaux, and printed in "The Beaver," a little paper published under the auspices of the university.

The last interim report of the director shows that over 50,000 soldiers have received class instruction through the various departments of the Khaki university. Since the beginning of 1918 the number of extension lectures totals 1,484, the aggregate attendance at these lectures being 641,137.

This report draws attention to some of the difficulties that have had to be overcome. Besides those already mentioned, there was a serious difficulty resulting from the fact that the scheme was not formally authorized until the very eve of the armistice when there was an immediate call for work. Thus the organization had to be completed at the same time that the work was being carried on.

In spite of all these difficulties, however, the Khaki university has amply justified itself. Though the cost has been considerable, the full value of the money spent upon this gigantic undertaking has been received by the thousand men who have taken higher educational work alone. Putting the cost of education for a year at the very low figure of $750, the saving to these thousand men alone will be $750,000 - more than the sum total spent by the organization.

Further, the Khaki university of Canada has been the pioneer in an educational movement which, it is believed, will have lasting significance. Its influence has spread rapidly, not only to the British army groups - the imperial forces, the Australian, New Zealand and South African army. Each group has worked out its own problems, all striving, however, toward the common end of intellectual betterment, and the civil reestablishment of the men.

All have been generous in their acknowledgement of the Canadian as the

pioneer organization; and it is firmly believed that the initiative now being taken by the British and American armies in having an educational corps as a regular part of the army organization, will become a part of the regular educational scheme for armies in all states of the civilized world.

Photographs 1910-1988

Engineering Week,-1939

Muriel Smith Cheriton, Don Harvey and Jack Setters at the Engineer's Parade 1945.

Engineers' Parade Univesity of Alberta February 12, 1953. In front of South Lab - where Civil Engineering Labs were held. Con Hall in Background - Note lack of snow and how warm it was i.e. No earmuffs/hats/mitts. - Note ties and jackets common

Tony French and his wife, Engineers Ball, 1963

Virginia Webb McKay - P.Eng. Engineering Queen, 1946

When Engineers have a parade it's a parade! Bill Zeigler is leading the parade.

Clockwise: The "Med - Eng" Fight, 1937

Engineers parade, 1945 Burying of Casserole (Engineering edition of the Gateway) "Godiva" (Don Harvey) reading the service from a math text.

Ice Statue Engineering Week.

Med-Engineering battle, 1937.

Survey School circa 1914.

First Graduating Class in Applied Science, May, 1913, left to right: Joseph Wilburt Doze, Walter Maxwell Fife, Cyrus Percival Hotchkiss, Milton Brown and Walter Harold Draper.

COTC 1915-16
Captain H.J. MacLeod
Lieut. M. Fife,
Captain C.S. Burgess

John A. Allan (Geology) and Alan E. Cameron Engineering) on deck of H.B. Co. Steamboat, (Fort McMurray Area), 1919.

Geology students on a field trip about 1912. The woman in the photograph is Allan's assistant, Grace Stewart.

An architectural rendering of Dr. Tory's plan for the development of the University. The picture looks north and shows the High Level Bridge on the right. The existing residences are shown on the left of the central mall. At the far end of the mall is an envisaged Convocation Hall.

Graduating Class - Applied Science, University of Alberta, 1920

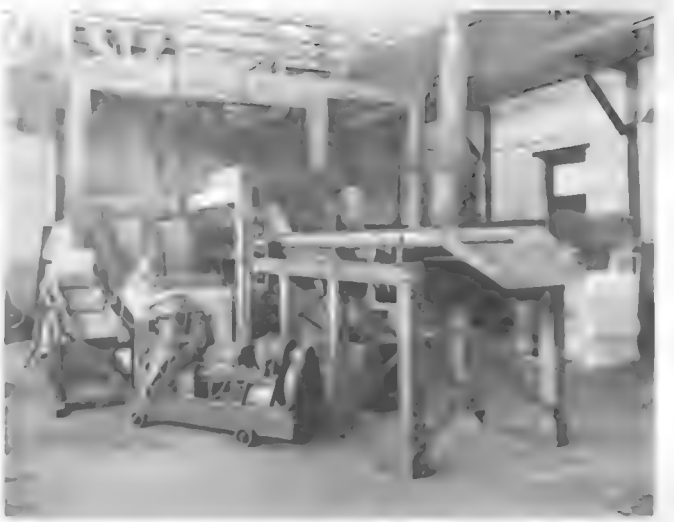
K.A. Clark with pot-stand and box of glass sealers.

K.A. Clark.

Applied Science Class of 1928,
University of Alberta.

Paving back courtyard behind Arts Building Court between laboratories and Convocation Hall, prepared for paving (1923).

Court between laboratories and Convocation Hall, prepared for paving, using material from the Tar Sands (1923).



Dr. Karl Clark and Dr. David Pasternack in the tar sands experimental laboratory located in the Department of Mining Engineering.

Coal Research Experimental laboratory.

Geology department - 1950.
J.A. Allan,
A.H. Manifold,
R.E. Folmsbee,
P.S. Warren
C.R. Stelck and
R.L. Rutherford.

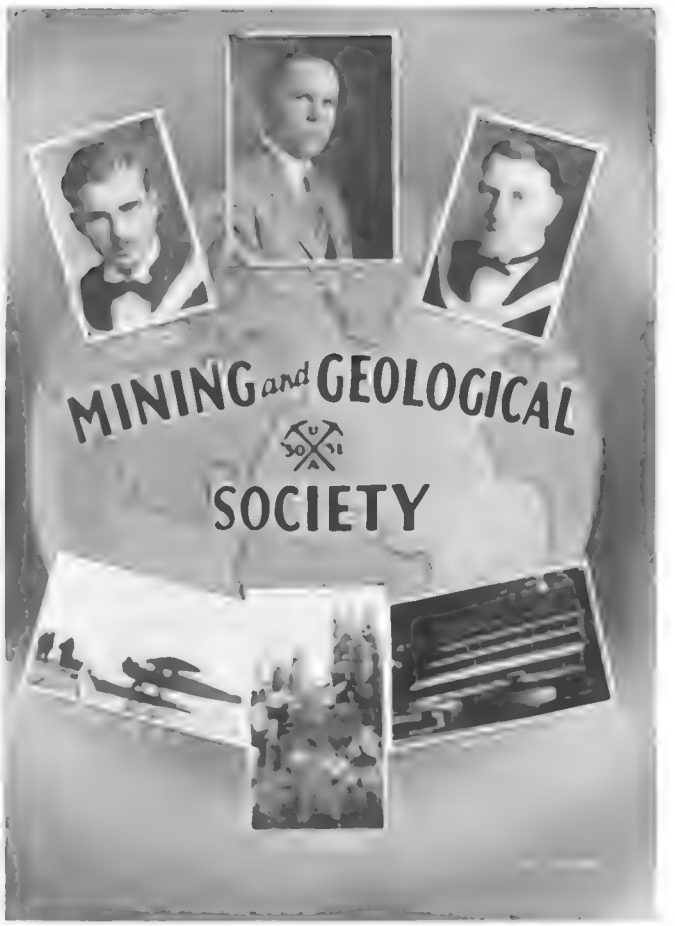
Civil Engineering Staff - 1950
J.A. Randle, J.L. Jasper, G.F. Coates, J. Longsworth, J.F. Hunt, P.H. Bouthillier, H.L. Kasten, F. McPherson, A. Roshko, G. Ford, S.R. Sinclair, N.L. Reid, L.A. Thorssen, Miss E. Glauser, I.F. Morrison, L.E. Gads

Senior Class, Department of Mining and Metallurgy, 1930
Back row: Professor Norman Charles Pitcher, Robert Thomson McAndrew, George Edward Moody, Peter Donald McArthur, George Kenneth Loisther, Professor Alan Emerson Cameron. Middle row: William Norwell McClintock, Alden Denton Harding, Stewart Bothwell, Donald Kenneth Burke, John Frederick Kotash. Front row: Bertram Elford Souch, "Tom" Holmes

1937 Civil Engineering Graduates

Clockwise: Aggregate piles - Grand Coulee Dam.

Mining and Geological Society 1930/31.



Hamlet of Cadomin, 1938

Field trip to Grand Coulee Dam - Fall, 1938

"The Dean reported that the seven students in fourth year Civil Engineering together with two members of the staff, had taken a week at the beginning of the session to go on a trip to the Grand Coulee Dam. This trip was made possible through the donation of $100.00 by Mr. R.A. Brown, R.P.E., of Calgary. A receipt has been forwarded to Mr. Brown for this amount bur formal acknowledgement will be made in due course."

Minute Book Number 4, Page 21. Minutes of the Faculty of Applied Science November 14, 1938

Class of 1939 - Civil Engineering

Class of 1939 - Civil Engineering

Demolition of "Hot Caf"

High-jinks in front of the Power Plant-Electrical Engineering students about 1930.

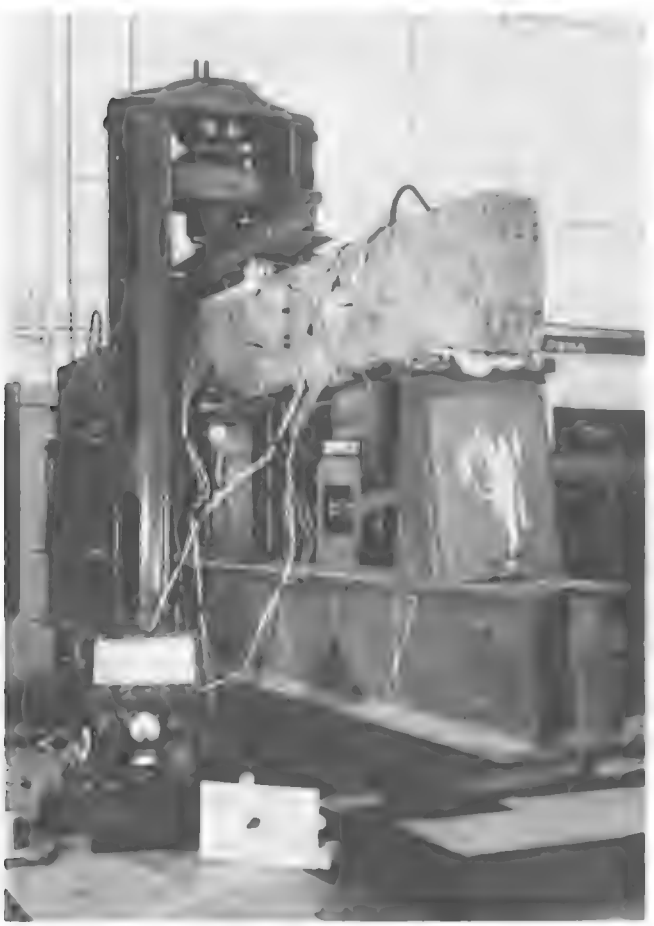
Doug Layer, a graduate in geology from the University, anticipated reefal presence in Alberta after examining wells in the old Victoria settlement area; Layer persisted in his explorations in the area. The strike at Leduc ushered in a new era in Alberta which brought with it a very high demand for engineers.

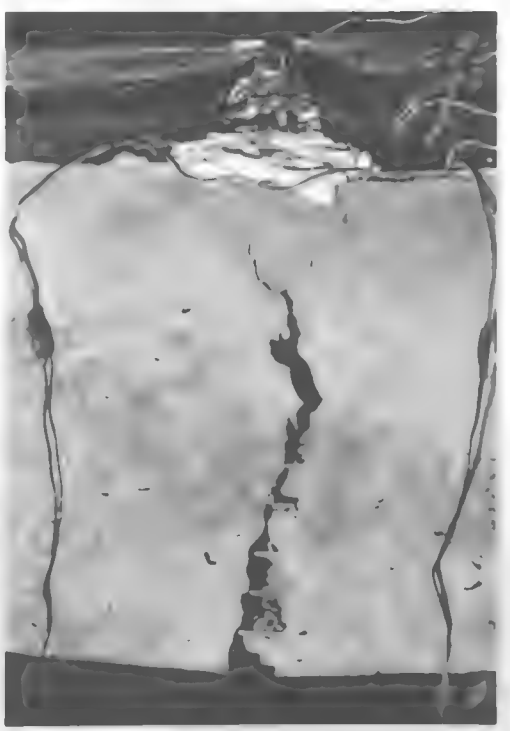
Gelogical survey 1935, Nahanni River, The Divide to Prairie River, A.E. Cameron, Lee Cameron (son)

In 1954 the new Engineering Building was on show. Here a Strength of Material Lab. is twisting a steel rod to failure.

Failure in prestressed concrete beam.

Prestressed concrete beam under test on Riehle Testing Machine.

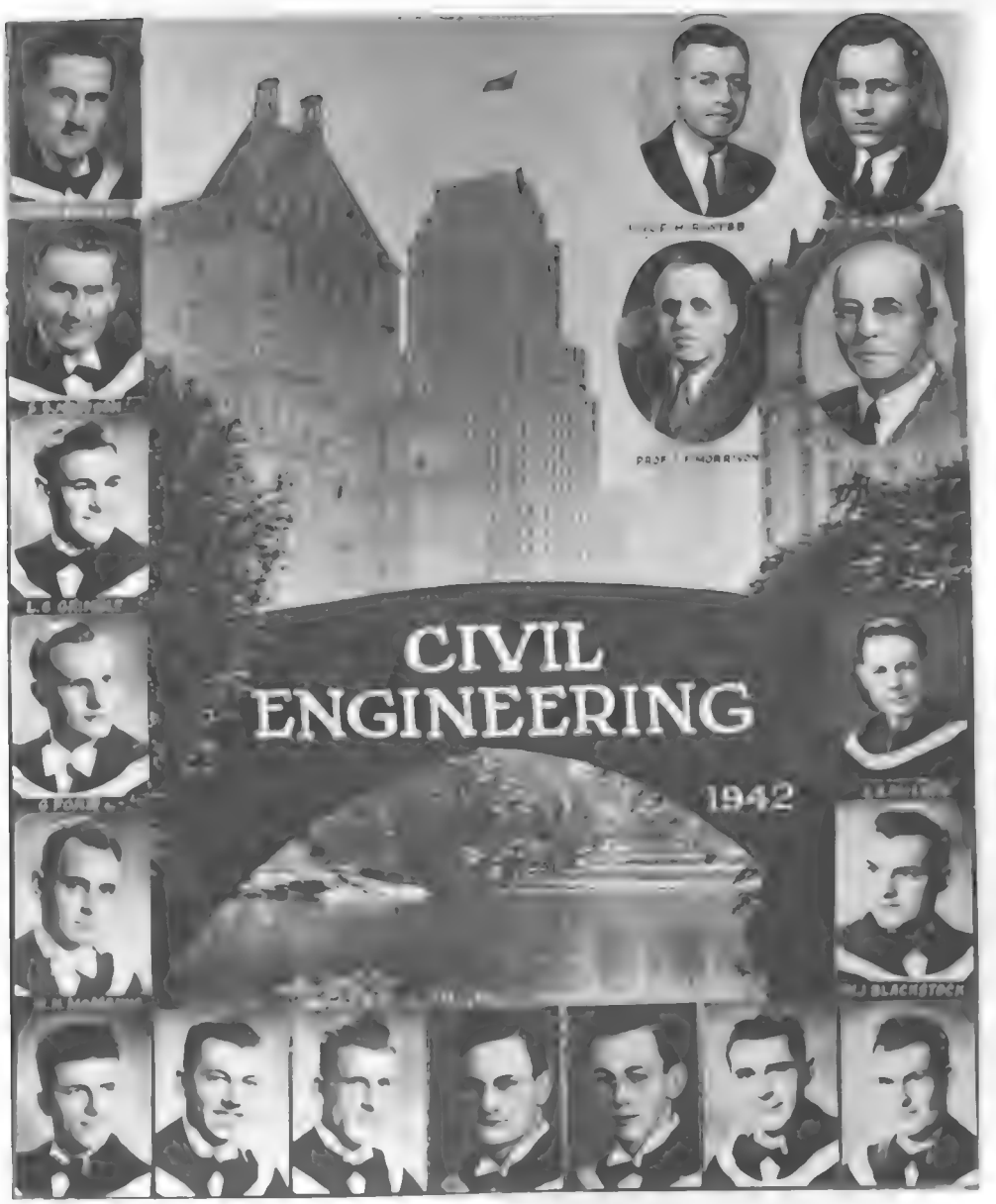




Alaska Highway - army road above - permanent road under construction below, at Muncho Lake - 1943.

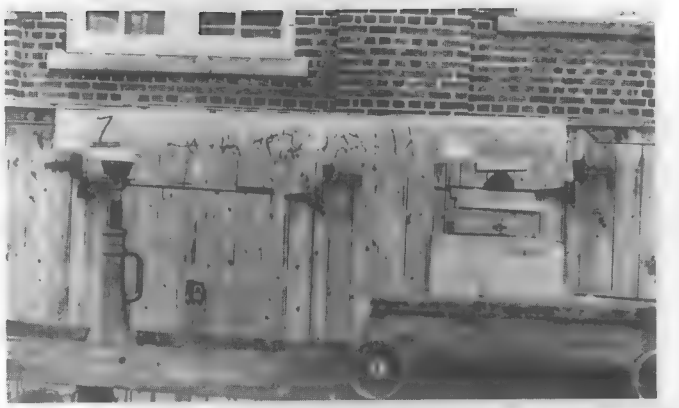
Twenty-fifth reunion of engineering class of 1944 with Professors Wally Preston, Stew Davis, Len Gads, and Walter Lilge

Civil Engineering Class of 1942.



Engineering Drafting Class, 1946

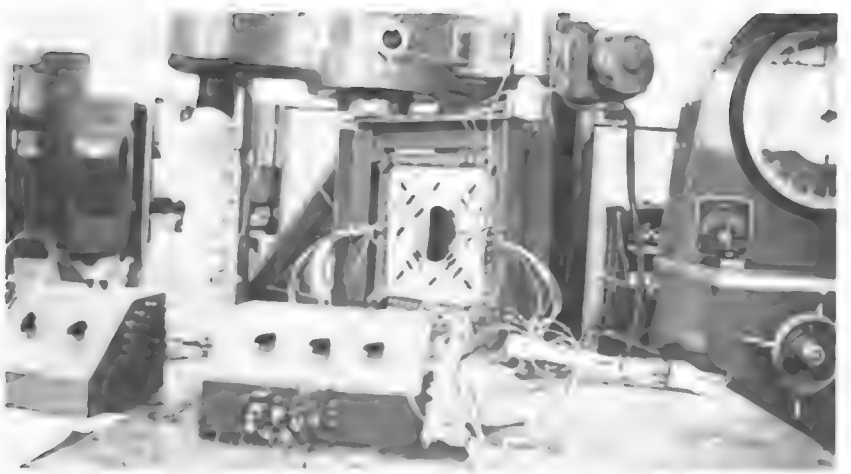
Third year electrical engineering, 1945

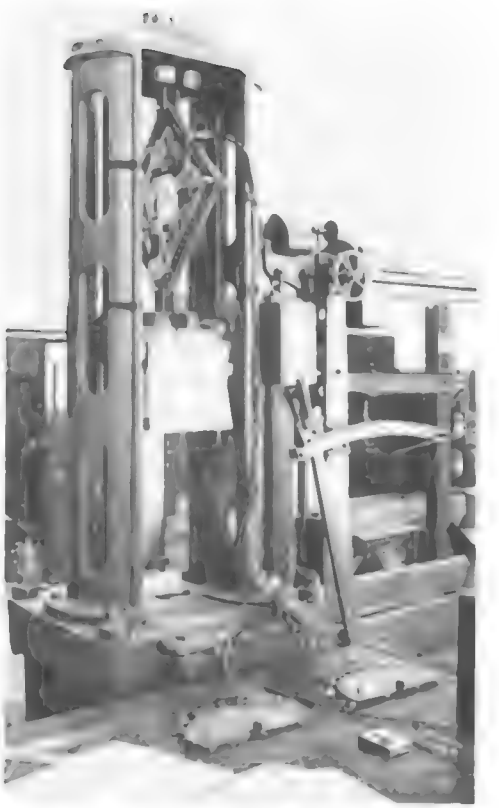


Habakkuk - Column test at Patricia Lake - 1943.

Habakkuk - Beam test in front of Civil Engineering Lab - 1943

Alaska Highway Section-D Mile 55

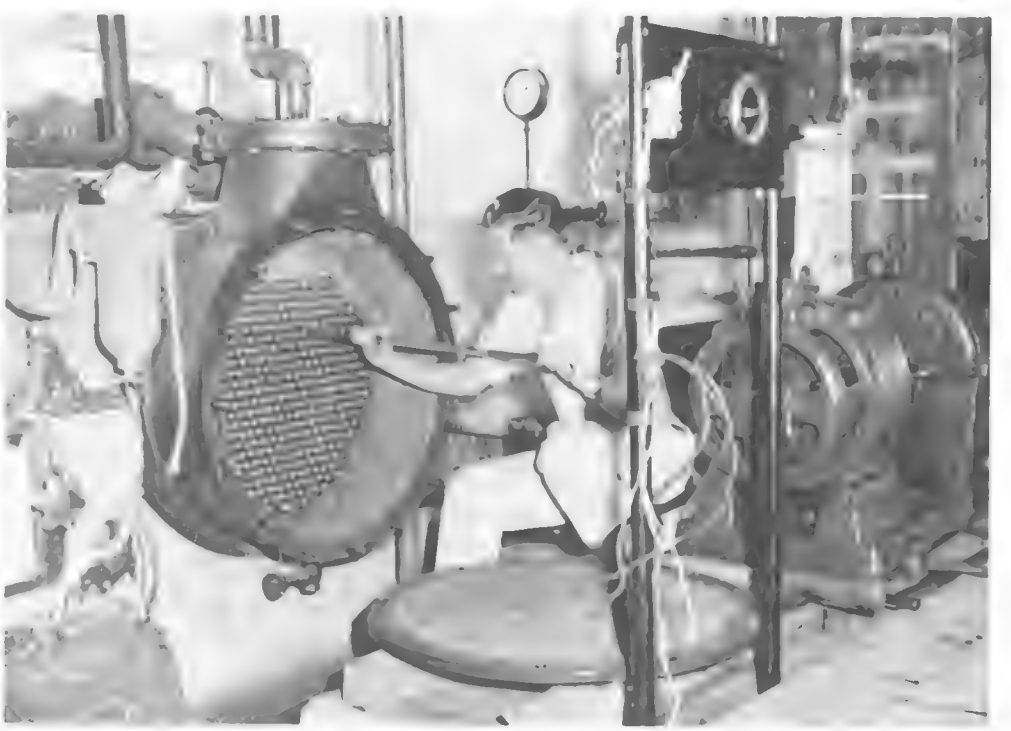




Experimental determination of stress concentration in the vicinity of a large hole. The Faculty's first contract with the National Research Council, 1952.

Experiment in the Balwin Testing Machine.

Experiment in the Riehle Testing Machine.

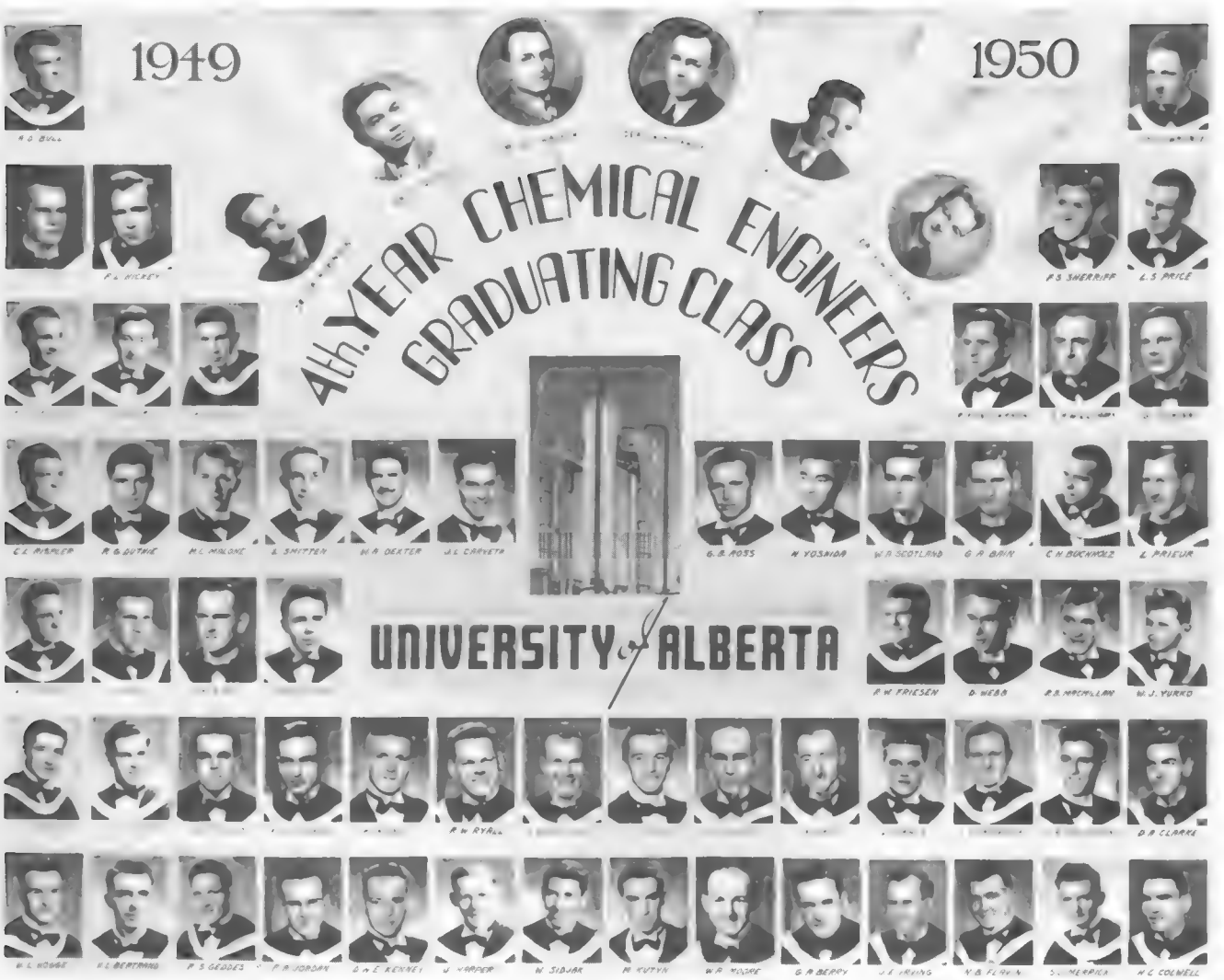


August, 1951 Tex Eymundson Stripping the Condenser Mechanical Engineering - Photo from inside the "Red Hut" used to house thermo lab before the new wing was added to the Engineering Building.

Doug. DeWolff, Professor I.F. Morrison and Frank Hastie at the sod-turning ceremony for the expanstion of the engineering building, August, 1956

Survey School, 1954 - Main Quad, Notice - no physics or chemistry buildings

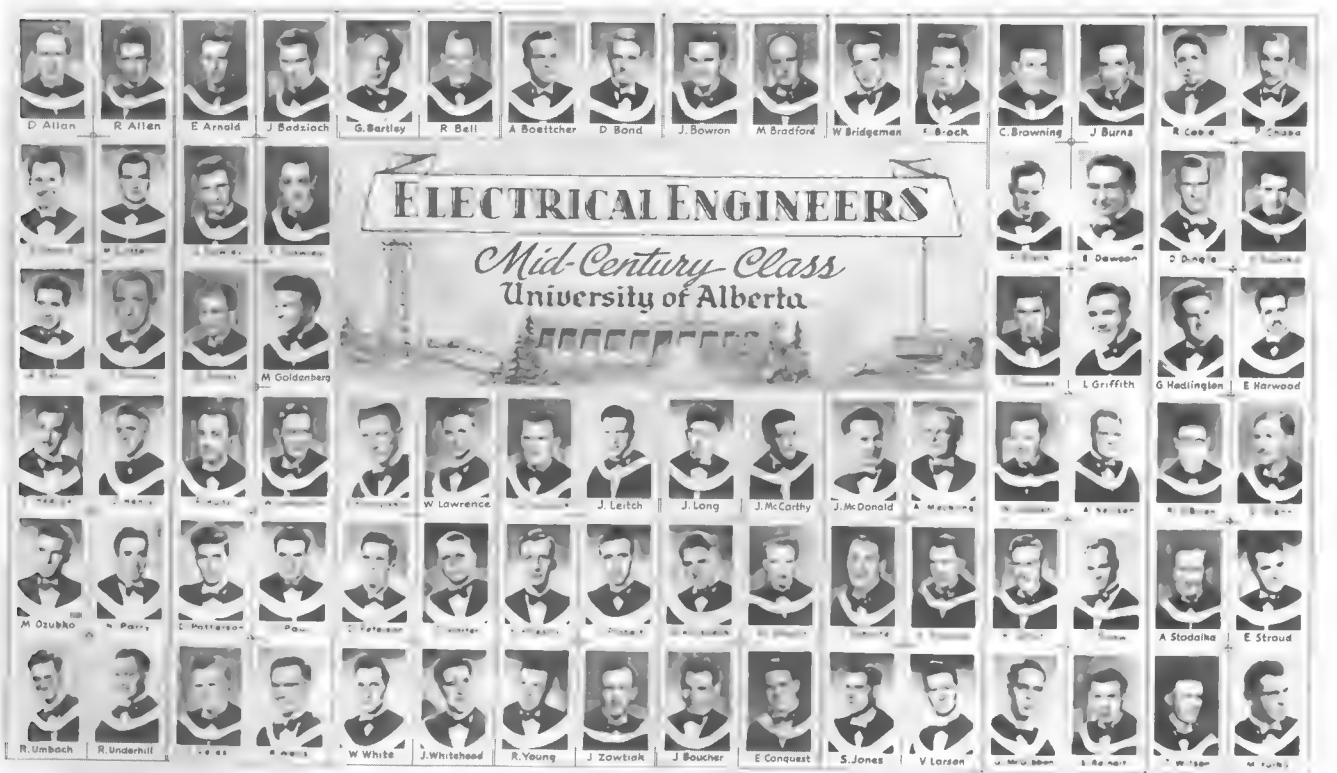
Chemical Engineers,
University of Alberta, 1950



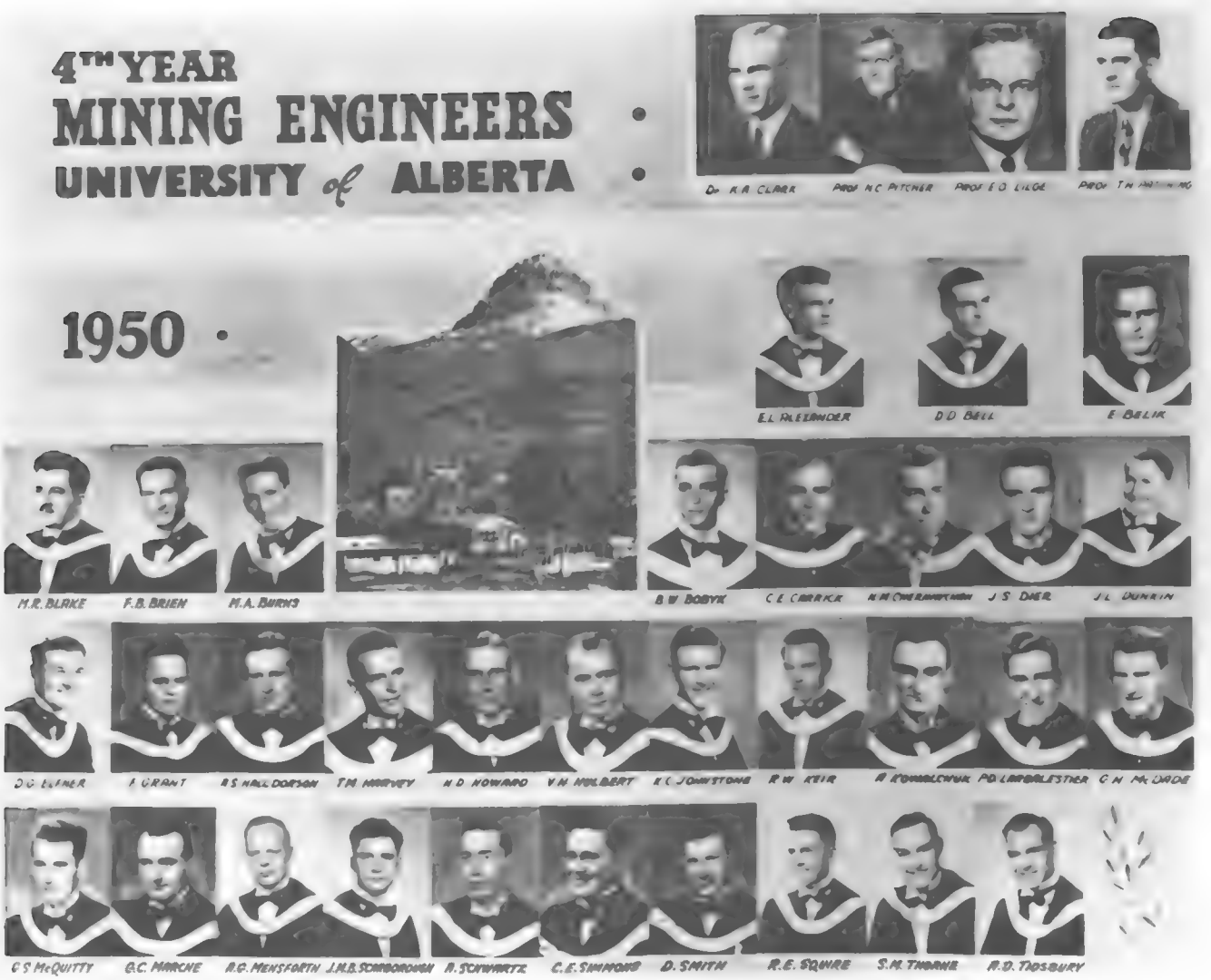
Civil Engineers, University of Alberta, 1950

House Dance and Slide Rule Contest - 1953. Bill Weir - Presenting winner with prize a slide rule, Bill Martenson Winner of contest holding 80" model slide rule. Pete Andrew - Runner-up, Don Carlson - ESS President in Background.

Electrical Engineers, Mid-Century Class, University of Alberta



Mining Engineers, University of Alberta, 1950



Petroleum Engineers, University of Alberta, 1950

Chemical Engineering Club Executive in 1956 with Dr. Govier, Head of the Department of Chemical and Petroleum Engineering. They are: W. Leight Short, Don E. Ruskin, Fred D. Otto, T.W. Fraser Russell. This was the formation of a student chapter of the American Institute of Chemical Engineers at the University of Alberta.

Annual Meeting of APEGGA S.L. Stolte, Past President National Society of Professional Engineers - (USA) E.K. Cumming, L.A. Thorssen Edmonton, 1955

Athlone Scholarship Tour W. Porteous. Fourth from left in front row.

Clockwise: Gerry Stephens - Joe Wright Chemical Engineering, 1963

Irene Walker, Secretary in the Office of the Dean of Engineering, 1969-1972. Lola Logan, Secretary in the Department of Civil Engineering, 1945-1967; Secretary in the Office of the Dean of Engineering, 1968-1981.

Sun Shots - Kootenay Plains Survey School, 1968

January, 1959. Mechanical Building "Sheep Sheds".

Official opening of the Civil/Electrical Engineering building

Staff of Mining and Metallurgy, 1961

Rich Swann presenting L. Gads his APEGGA Life Membrship Certificate

Walter Bigg (Left), and Pat Bouthillier (Right) Survey School at Camp Wainwright, April, 1976

Retiring Members of the 1971 APEGGA Board of Examiners. Six of the thirteen board members are graduates of the Faculty. Five board members are professors at the Faculty.

John R. McDougall, P.Eng. (Civil Engineering Class of 1967), great grandson of John A. McDougall - accepting APEGGA award for three years service on APEGGA Council from Emil Sanden, P.Eng., (Civil Engineering Class of 1946), President of APEGGA

Dr. Ralph McManus, P.Eng. receives Centennial Award from President Emil Sanden, P.Eng.

Annual Meeting in Red Deer, 1978 Twelve of the 16 past Presidents are graduates from the University of Alberta

S.M. Blair is awarded an Honourary Doctor of Laws, at spring convocation, 1975 with George Ford (left), Dean of the Faculty of Engineering

Gerry Maier at the 1978 Annual Meeting of APEGGA at Red Deer

Ron Graham, IBM Canada Ltd. accepts a plaque from Roger Toogood of Mechanical Engineering acknowledging the donation of computer equipment for the mechanical engineering laboratory.

Left to right: George Ford, Harry Hole, Fred Hagen, Don Bellow, Fred Otto, Doug Dale, Gary Faulkner Presentation - Twenty-fifth Anniversary of Mechanical Engineering

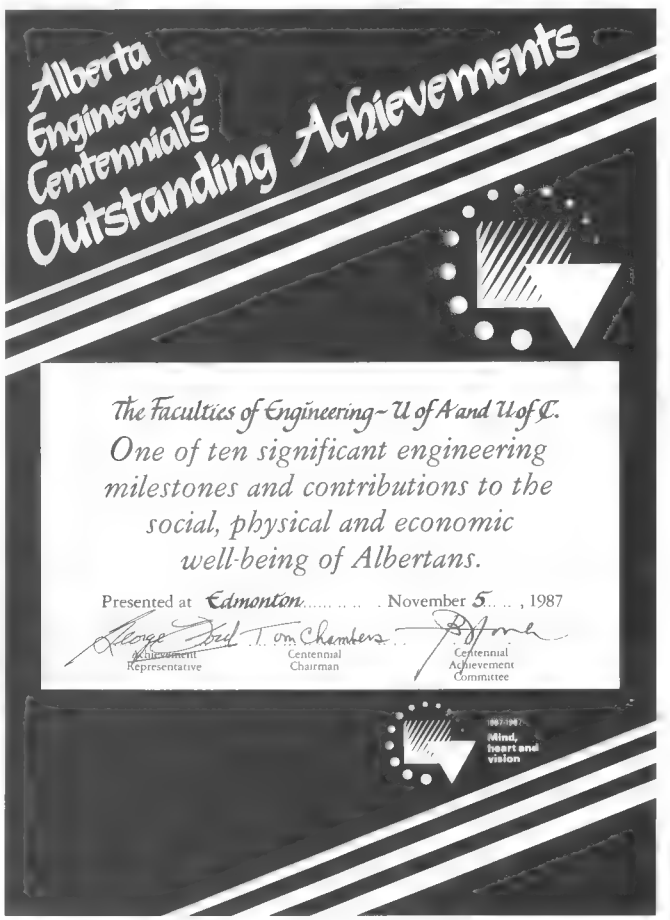
Rich Swann presenting George Govier with his APEGGA Centennial Award

Civil Engineering Student Desmond Williamson, 1986 Gads Memorial Scholarship Winner with Professor William Weir, Construction Engineering

Dr. Robert M. Hardy is awarded an Honourary Doctor of Laws at the Fall Convocation, 1977. Dr. Harry Gunning, President, Mr. R. Dalby, P.Eng., Chancellor, Dr. Hardy, and Dr. George Ford

1977 Convocation: Ron Dalby, Chancellor, Civil Engineering Graduate 1950; Dean Hardy receiving Hon. Dr. Laws; G. Ford of Mechanical Engineering

Craighton Twa presents a $40,000 cheque to Fred Otto, Dean of Engineering at the University of Alberta. The money will fund the Alberta Power Centennial Awards, a new program that will provide awards of $2,000 each to two engineering students every year. The Centennial Awards commemorate the 100th anniversary of the engineering profession in Canada.



History of the departments in the Faculty

Chemical

$$P = \frac{RT}{v-b} - \frac{a}{v(v+b)+b(v-b)}$$

Chemical Engineering

By S.E. Wanke

At this University, Dr. O.J. Walker and Dr. J.W. Shipley of the Department of Chemistry supported and assisted in the establishment of a chemical engineering course in 1926. Dr. E.H. Boomer, who joined the Chemistry Department in 1925, was also instrumental in establishing chemical engineering here. He became chairman of the committee on chemical engineering in 1942 and was appointed the first professor of chemical engineering in 1943. Dr. Boomer, who contributed significantly to research and development associated with Canada's war effort and who became an international expert in the oil and gas field, unfortunately died at the early age of 45 in 1945.

A separate department of chemical engineering was not formed until 1946. It was headed by Dr. J.A. Taylor to 1948 and then by Dr. G.W. Govier whose first appointment was that of a lecturer in 1940. Much of the credit for the program we have today must go to Dr. Govier who was Head from 1948 to 1959 and to Dr. D.B. Robinson who headed the Department from 1959 to 1970. The Department has had three other chairmen. Dr. F.D. Otto served as Acting Chairman from 1970 to 1972 and as chairman from 1975 to 1984. Dr. D.G. Fisher was Chairman from 1972 to 1975, and Dr. S.E. Wanke has been Chairman since 1985.

The early curriculum for a specialization in chemical engineering gave a heavy emphasis to chemistry courses (inorganic, organic, physical, analytical and industrial) and included physics, mathematics, geology and economics and engineering courses selected from applied thermodynamics, applied mechanics, hydraulics, surveying, mapping, materials of construction, statics, strength of materials, ore dressing, metallurgy, fire assaying and electrical engineering. These latter courses were given by the departments of Civil, Mining and Metallurgy, and Electrical Engineering.

The unit operations concept, which provided a systematic way of dealing with the design and analysis of the various physical operations which are common to a great variety of chemical processes, was not introduced into the curriculum at Alberta until the early 1940's. It was through Dr. Govier's initiative and leadership that this concept, along with the use of material and energy balances (Industrial Stoichiometry) to assist with the analysis of industrial processes, was firmly entrenched into the curriculum. The development of the unit operations concept reinforced the need for students to gain hands-on experience with the operation and analysis of industrial type equipment and accelerated the installation of unit operations laboratories which housed industrial plant-type equipment.

Dr. Robinson was appointed to staff in 1948 and contributed early strength in

the teaching of material and energy balances, chemical engineering thermodynamics and process design. Also in 1948, a formal program of training leading to a B.Sc. degree in petroleum engineering was begun. Courses were offered in gas and oil production and transportation, reservoir engineering and properties of petroleum fluids. Besides Govier and Robinson, staff contributing to this program were J.W. Gregg, D. Quon, P.M. Dranchuk, D.L. Flock, W.K. Nader and R.G. Bentsen.

The 1950's and 60's were a period of rapid growth for the Department as it was for most engineering departments. The full time professorial staff complement increased from 4 to 14 in the twenty-year period from 1950 to 1970. This increase was required to accommodate increasing student enrolments at both the undergraduate and graduate levels and to offer a greater number of chemical and petroleum engineering courses.

This was also a period for evolution and maturing of the chemical engineering curriculum. Curriculum matters took a good deal of staff time for discussion and decision. The virtual explosion in scientific and technological advances following the second world war brought pressures to include course material related to these advances, e.g. computer process control, catalysis, polymer engineering, etc. It was also recognized that many of the chemical engineering unit operations have certain basic mechanisms in common and that the analyses of these operations could be put on a more fundamental basis through the concept of transport and rate processes. Thus a need developed to include courses which dealt with the fundamentals of momentum, heat and mass transfer. This approach, in turn, required a much broader and deeper training in physics and mathematics and a much greater facility with the latter. Concerns were expressed about the lack of design-oriented material in the curriculum and, since engineering design in the broad sense should take into consideration social and environmental implications, a need was identified to give engineering students a greater exposure to humanities and social science material. These issues, along with concerns about the communicative abilities of engineering students, created pressures to add an inordinate amount of new material to the curriculum.

An early concern had been to develop a curriculum that contained sufficient engineering to distinguish the chemical engineer from the industrial chemist; now the problem was to add new material and yet retain sufficient chemistry to distinguish chemical engineers from other engineers. Compromise solutions to resolve the dilemma as to what material should make up the curriculum gradually evolved. Assisting in arriving at these solutions was the accreditation system which was initiated in 1965 to evaluate engineering programs in Canada. This system helped to set standards and to bring some degree of uniformity to programs across the country, particularly in the design and humanities/social sciences components.

In brief, changes which have occurred in the past thirty years of curriculum development include: courses in analytical and industrial chemistry were gradually dropped from the curriculum as were several courses offered by other engineering and science departments, e.g. geology, surveying, fire assaying, metallurgy and strength of materials; transport phenomena theory was introduced into the unit operations courses and these were eventually broken down into the subject areas of fluid mechanics, heat transfer, mass transfer and equilibrium stage processes; R.A. Ritter introduced a program of courses in 1961 dealing with process instrumentation, control theory and the dynamics of industrial chemical processes and these subjects have since comprised an area of special strength in our chemical engineer-

ing program; Dr. H.W. Habgood, of the Alberta Research Council, introduced an elective course on applied reaction kinetics in 1955 and reaction kinetics and reactor analysis has been part of the core program since 1960; Dr. R.K. Wood was instrumental in introducing an undergraduate option in computer process control in 1985. Emphasis on a "hands-on" laboratory experience has been retained and given additional prominence by including separate laboratory courses in the final two years, adding experiments in process control and adding a research project type assignment in the final term; a design sequence was incorporated into the program by moving the industrial stoichiometry course from third year to second year, and by introducing a design course into both third and fourth year - the senior course being an open-ended design project. In order to make specialized technology of interest to chemical engineers available to students, a scheme of technical electives, which now comprise about 10% of the curriculum, was gradually incorporated into the program. This flexibility allows some specialization in areas of particular interest to a student and recognizes that a student cannot be expected to cover all areas of new technology if he or she is to penetrate them to any depth; in a like fashion the liberal arts content of the curriculum was strengthened and electives in these areas now make up about 7% of the curriculum; a first course in thermodynamics was moved into second year in 1966 and was given as a service course to all second year engineering students. (It is now taught to all second year students except those in Civil and Mining Engineering.)

The Department has a long history of applied research directed toward the development of Alberta's natural resources. Dr. Boomer launched research programs in the 1930's which dealt with the properties and processing of oil, natural gas, coal and bitumen. This included experimental work on the hydrogenation of coal and bitumen from the tar sands and studies on the phase equilibria of two-phase gas-liquid hydrocarbon systems to get information on the conditions in oil and gas reservoirs. These are still important problems and this kind of research is still carried out in the Department. Dr. Govier's research on two-phase flow, which has application to the production and transportation of oil and gas, Dr. Robinson's internationally recognized work to characterize the phase behavior of oil and gas systems and Dr. Quon's use of mathematics and computers as tools to assist with the analysis of complex engineering problems set early high standards for the Department's research effort.

The first M.Sc. degree in chemical engineering at Alberta was granted in 1945 and the first Ph.D. in 1961.

Graduate studies, as measured by the number of degrees granted and research output, developed strongly after 1945. There was a downturn in the number of graduate students after about 1970. Reasons for this included the adverse publicity which resulted from several chemical companies closing down research and development activities and the resulting difficulty that Ph.D.'s with science degrees had in obtaining jobs, the NRC policy which forbade supporting foreign students from grant funds and, in recent years, the excellent job opportunities for B.Sc. engineering graduates. However, research activity in the Department continued to grow with a greater emphasis being given to industrially supported contract research and to the use of postdoctoral students and research assistants. Many of the postdoctoral students have been chemists.

Recent enrolment trends indicate a renewed and increasing interest in studying for advanced degrees in chemical engineering.

In 1948, in response to requests from many quarters, it was decided to begin a formal program of training leading to a B.Sc. degree in Petroleum Engineering. Consequently the Department assumed a dual role and added the word "Petroleum" to its title. This program continued throughout the 1950's and graduate work was added about 1953. Over the period 1950 to 1965, 214 B.Sc. degrees in petroleum engineering were granted. Many of these graduates have made major contributions to the development of the petroleum industry in Alberta and many occupy senior positions with petroleum companies today. There was, however, a significant decrease in undergraduate enrolments in the program beginning in the late 1950's and, following an exhaustive study of undergraduate trends, approval was given to discontinue the B.Sc. program in 1963. However, the graduate program leading to M.Sc. and Ph.D. degrees in petroleum engineering was continued and senior undergraduate courses in reservoir engineering were made available to senior students in all B.Sc. engineering programs. In 1972, after a study by the Faculty of Engineering, petroleum engineering was transferred to the newly formed Department of Mineral Engineering. Resources, including space, a portion of the operating budget for support staff, supplies and sundries and graduate teaching assistants, etc., two academic staff (P.M. Dranchuk and R.G. Bentsen) and equipment were transferred to the new department and the word petroleum was removed from the Department title. One adverse effect of this is that it is now very difficult for chemical engineering students to take elective courses in reservoir engineering.

In light of projected enrolments, it became apparent to Dr. Robinson in about 1962 that the Department faced a severe space shortage. At that time it occupied approximately 2600 m^2 of space in what are now called the Dentistry-Pharmacy Centre and the Civil-Electrical Engineering Building. Planning was begun under the direction of Dean Govier for an engineering centre. Phase 1 of this proposed centre was eventually approved, designed and built to accommodate the needs of the present Departments of Chemical, Mining, Metallugical and Petroleum Engineering to the year 1985. Chemical and Petroleum engineering moved into about 5,000 m^2 of space in the eight-story building in 1968 and this gave our Department facilities that were better than those of any chemical engineering department in Canada.

Machine and instrument shop facilities for the construction and repair of laboratory equipment have been associated with the Department for many years. In addition, until 1972, the Department operated a stores facility for the provision of metals, fittings and miscellaneous supplies. Responsibility for the stores operation was handed over to the purchasing department in 1972. The instrument and machine shops have been responsible for the building and assembly of much of the equipment used in our teaching and research laboratories. The availability of an in-house capability to repair equipment and to produce specialized equipment is crucial to our operation and has contributed greatly to teaching and research efforts.

In the early 1960's the Department gave strong support to R.A. Ritter's initiatives to establish teaching and research programs in the area of industrial process control. At the same time general purpose digital computing was also being initiated on campus and Ritter and D.G. Fisher, who joined the staff in 1964, began evaluating the possibility of installing computer capability for real-time sensor-based (RTSB) laboratory automation and process control. Ritter left to head the new Department of Chemical Engineering in Calgary in 1966 but, under the leadership of Fisher and Robinson, the matter was pursued and, in conjunction with the

expansion of the chemical engineering program and the move to the new building, funding was generated from university sources for the rental of an IBM 1800 system and for support staff to operate the facility. The IBM 1800 was installed and operating in the new building in 1968 and was eventually purchased by the University in 1972. This computer system and associated pilot and laboratory facilities composed the heart of the Department's Data Acquisition, Control and Simulation (DACS) Centre. The Centre's mandate was and is to support teaching, research, service functions and industrial liaison in the general area of RTSB computer applications. The DACS Centre facilities and associated pilot plants and laboratories provided a facility of hands-on, RTSB student applications and process-oriented research that was unequalled anywhere in the world. A generation of graduates were attracted to and profited from educational and research programs that used these facilities. Two of the first Canadian computer installations for process control were at Alcan's aluminum plant in Arvida, Quebec and Imperial Oil's main refinery in Sarnia, Ontario. The IBM 1800 installed by Imperial Oil was done at the same time as the one in our DACS Centre and was similar in hardware configuration and applications. Therefore our students gained relevant experience and were eagerly sought after by Imperial Oil, Alcan, and others who followed with their own installations.

The 1970's brought mini and micro computers that provided a cheaper and, in many cases, more effective means of implementing many applications. Microprocessors were incorporated in instruments such as GC's and computer applications became "distributed". It thus became clear that the single, centralized-CPU, IBM 1800 should be replaced by a 'distributed network' of mini and microcomputers. It was in this period that Honeywell's computer-based, TDC 2000, process control system was introduced and IBM announced their "Advanced Control System" for large process plants. (One of the four ACS systems sold world-wide was installed in Imperial Oil's Edmonton refinery.) After a lot of investigation and discussion, a proposal was made to replace the IBM 1800 by a distributed network of 'general-purpose' mini and micro computers. A major equipment grant was obtained from NSERC to continue research of the type started on the IBM 1800 and the university made a special capital grant in recognition of the educational and general service functions of the DACS Centre. The distributed computer network, centered around three HP/1000 mini-computers was acquired with these funds and installed in 1977 through 1980.

Degrees in chemical engineering have been given at this university since 1928 and B.Sc. graduates now total 1595. The number of B.Sc. graduates has fluctuated over the years, and currently is about 40 per year. The graduate student enrolment is currently at about 40; about one-quarter of the graduate students are enrolled in Ph.D. programs. A total of 198 M.Sc., 45 Ph.D. and 22 M.Eng. degrees have been awarded to date. At one time many Alberta graduates found employment in industries in Ontario and Quebec. However, for the past two decades, the majority of graduates have remained in Alberta.

The first chemical engineering graduate from the University of Alberta, Mr. Darcy Morris, retired in 1971 as executive vice-president of Cominco. His career perhaps typifies that of a large number of our graduates who have made major contributions to the development, operation and management of the oil, gas, petrochemical, pulp and paper, nuclear and other industries in Canada, the United States and elsewhere.

Chemical Engineering Degrees Awarded

Year	*B.Sc.*	*M.Sc.*	*M.Eng.*	*Ph.D.*
1928	3			
1929	-			
1930	6			
1931	2			
1932	6			
1933	8			
1934	6			
1935	13			
1936	8			
1937	8			
1938	11			
1939	16			
1940	8			
1941	14			
1942	15			
1943	18			
1944	19			
1945	11	1		
1946	29	4		
1947	12	-		
1948	18	4		
1949	58	1		
1950	59	1		
1951	30	5		
1952	23	3		
1953	13	2		
1954	23	-		
1955	10	2		
1956	36	2		
1957	29	3		
1958	34	5		
1959	26	5		
1960	38	6		
1961	40	3		1
1962	33	4		-
1963	22	6		2
1964	34	4		-
1965	33	6		2
1966	31	9		3
1967	37	6		3
1968	36	6		3
1969	33	9		-
1970	44	7		-
1971	39	7	2	7
1972	47	13	1	1
1973	37	17	1	1
1974	39	4	1	3

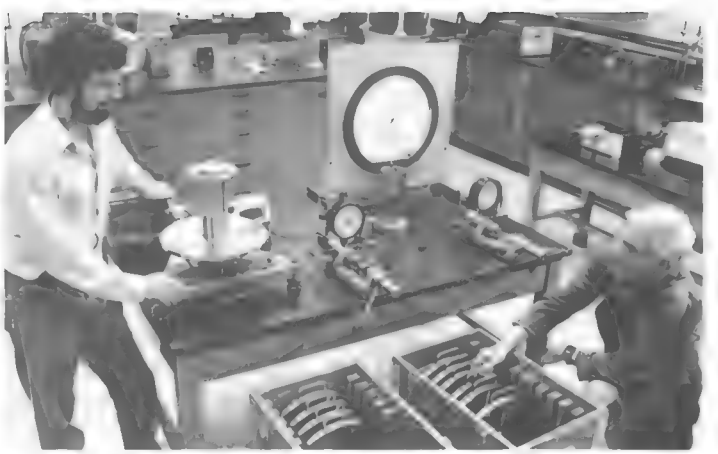
1975	20	6	1	2
1976	26	2	2	1
1977	34	6	-	3
1978	47	4	1	1
1979	41	7	-	-
1980	41	6	-	1
1981	37	2	-	2
1982	42	6	4	3
1983	44	3	4	1
1984	42	5	2	1
1985	29	6	3	2
1986	37	3	1	1
1987	40	6	0	1
Total	1595	207	23	45

Former and Present Academic Staff

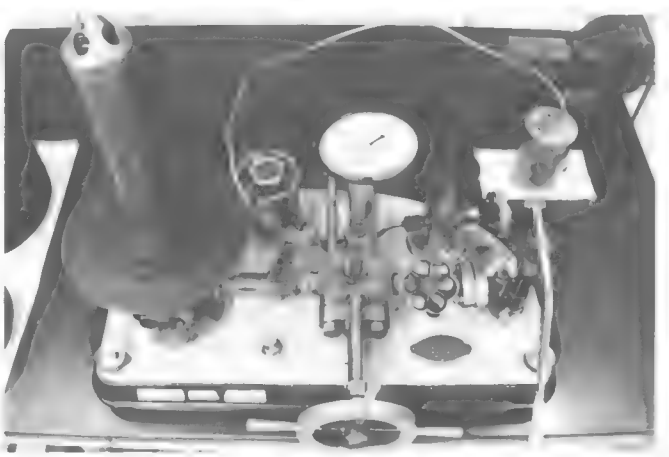
G.W. Govier	1939-1963
J.A. Taylor	1946-1948
D.B. Robinson	1948-1984
A.L. Scott	1948-1955
J.W. Gregg	1949-1957, 1967-1970 Petroleum
P.M. Dranchuk	1952-1973 Petroleum
R.A. Ritter	1955-1969
D.L. Flock	1957-1967 Petroleum
D. Quon	1958-1980
I.G. Dalla Lana	1957-Present
L.U. Lilleleht	1960-1966
K. Aziz	1960-1963 Petroleum
W.K. Nader	1960-Present
F.D. Otto	1962-Present
D.G. Fisher	1964-Present
J.T. Ryan	1965-Present
R.K. Wood	1966-Present
F.A. Seyer	1967-1976, 1984-Present
A.E. Mather	1967-Present
R.G. Bentsen	1968-1973
D.E. Seborg	1968-1977
S.E. Wanke	1970-Present
J.H. Masliyah	1977-Present
C. Kiparissides	1978-1983
S.L. Shah	1978-Present
D.T. Lynch	1981-Present
J.M. Martin-Sanchez	1981-1985 University Research Fellow
K. Nandakumar	1983-Present
M.R. Gray	1983-Present
K.C. Porteous	1984-Present
P.J. Crickmore	1985-Present
A.J. Morris	1984-1988

Former and Present Academic Staff

R.E. Hayes	1985-present
K.T. Chuang	1986-Present



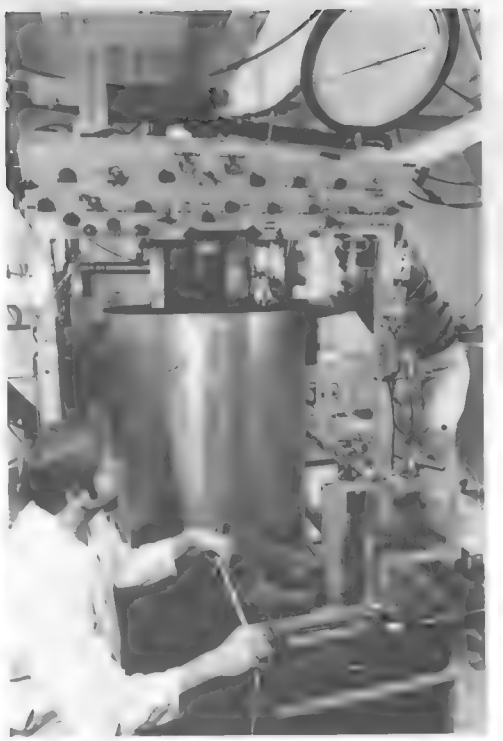
Glove Box for Catalyst Preparation



Loading a Precision Dead Weight Gauge

Antique Dead Weight Gauge

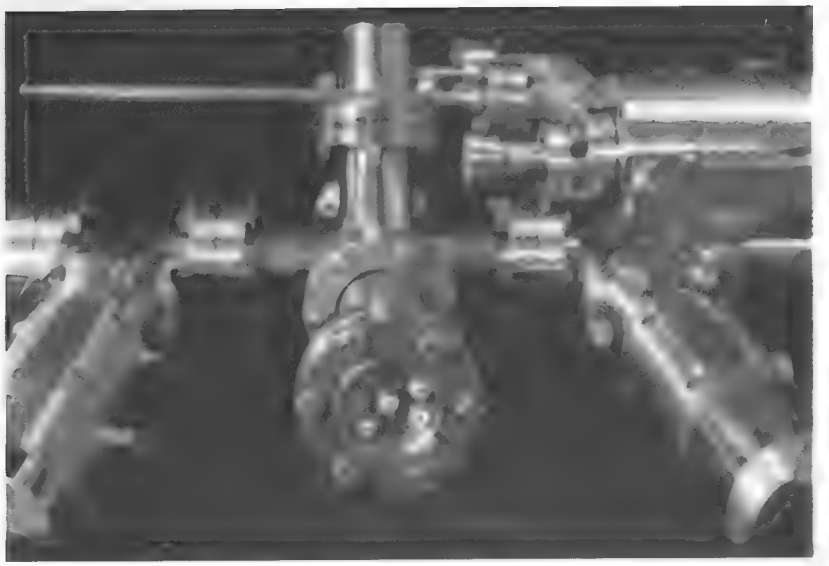
Fluidized Bed Experiment



Plotting of Data from the IR Spectrometer

Low Temperature Equilibrium Cell

Catalyst Samples



Manifold for Spectrometer

Shell and Tube Heat Exchanger Experiment

Phase Equilibrium Apparatus for Gas Hydrates

Civil

Civil Engineering

By J.G. MacGregor

The early history of the Department and the history of the formation of the Faculty of Engineering are one and the same. Professor Ford has described these early days in the first two chapters of this book. This chapter will highlight aspects of the development of the Civil Engineering Department.

The University of Alberta was authorized by the legislature in 1906. On July 6, 1908 the University Senate had its first meeting. Their first action was to appoint the first four faculty members -

- a Professor of Classics
- a Professor of Modern Languages
- a Professor of English, and Assistant Professor Muir Edwards was appointed to teach Mathematics and was named Lecturer in Civil Engineering.

Classes began on September 22, 1908 in the Duggan Avenue School, moving the next year to what is now known as Old Scona High School.

Three degrees were offered by the new university: a Bachelor of Arts, a "B.Sc. in Arts" and a "B.Sc. in Applied Science". At this time all three degrees were administered by the Faculty of Arts and Sciences. The latter two degrees were planned as four year degrees. In the case of the B.Sc. in Applied Science, however, the laboratories necessary for the third and fourth year courses were not ready in time and as a result, the students who started in Applied Science in the fall of 1908 did not graduate until May 1913.

In 1909 the Department of Civil and Municipal Engineering was founded, still in the Faculty of Arts and Sciences. Mr. W. Muir Edwards was promoted to Professor at that time and as such served as Head of the Department.

The staff in the new department grew slowly. In 1911 James Adam was appointed Instructor in Drawing. That year there were 129 students at the University - 23 of whom were in Applied Science. In 1912 I.F. Morrison, Lecturer in Civil Engineering joined the Department. He remained an active member of the faculty until his retirement in 1954. During this time he taught every Engineer who graduated from this University.

The original curriculum in the four year program in Civil Engineering is given in Table 1. A five year program was also available for persons without high school matriculation. In this program Years I and II were spread over three years.

Fees for the course were first year, $10 a term, subsequent years $15 a term. The calendar descriptions of the fourth year courses "Design" and "Testing Laboratory" stated:

Design

All students will be required to complete a design of a truss bridge for a given loading and span. In addition the student will be required to carry out a design of works (with estimates of costs, quantities, etc.) in the particular branch of civil engineering in which he may wish to specialize as follows:

- The design of a sewage disposal plant of given capacity.
- The design of a water purification plant of given capacity.
- The design of a garbage disposal plant of given capacity.

- The investigation of a watershed as a source of supply for water power purposes, together with the design of a power plant to utilize the same.
- The design of the details of an irrigation project.

- The investigation of the financial advisability of curve and grade reduction and high level bridge construction on a basis of saving in cost per ton mile, freight tonnage, etc.
- The design of yardage and terminal facilities for given conditions.

Note: Students will be required to select at the end of the third year the design which they wish to carry on in the fourth year and to submit a short thesis on summer reading assigned to them in this subject.

Testing Laboratory

Third Year: Tests are carried on to illustrate the principles in the lecture course on Theory of Structures and to determine the physical characteristics of the materials of construction. The tests include tension tests and compression tests in the 75-ton testing machine, determination of stress-strain diagrams by extensometers and scales, deflection of beams, deflection and vibration of spiral springs and torsional oscillation of wires, determination of Young's modulus for various materials, complete tests of cement, efficiency of chain blocks, etc.

Fourth Year: A more advanced course in the testing laboratory, the standard testing of brick, stone, cement, etc., the construction and testing of reinforced concrete beams.

During the summer of 1911 Athabasca Hall opened and the University moved from Old Scona High School to the new campus. More space was available in 1913 when Assiniboia Hall opened. The Department of Civil and Municipal Engineering was housed in Athabasca Hall which contained, among other things, a chemistry lab, classrooms, draughting rooms, testing labs, residence accommodation for 90 students, dining facilities for 300 and a gymnasium. The Calendar for 1914-15 states that a Hydraulics Lab was expected to be ready for the 1914-15 Session.

The University enrollment was 185 students in June 1912 of whom 41 were in Applied Science. By June 1914 this had grown to 434 and 83, respectively.

In October 1913, five months after the first graduating class, the Faculty of Applied Science was formed and the Department of Civil and Municipal Engineering moved from the Faculty of Arts and Sciences to the Faculty of Applied Sciences.

During the first World War many of the staff and students enlisted and served in Canada, United States and Europe. This effectively caused a hiatus in the operations of the Department of Civil and Municipal Engineering. Within days of the

end of the war Professor Muir Edwards died of influenza. Mr. James Adam was the only faculty member in Edmonton. The rebuilding of the Department started with the return of Assistant Professors Robb, Morrison and Fife from the services in 1919 and the appointment in 1920 of Professor Robert S.L. Wilson who became Head of Civil and Municipal Engineering.

The 1916-17 University Calendar indicated that the Faculty of Applied Science awarded a B.Sc. in Civil Engineering, a B.Sc. in Mining Engineering and a B.Sc. in Architecture although these programs were not being taught that year. Between 1918 and 1920 the Department of Drawing and Descriptive Geometry, Department of Mining Engineering and the Department of Electrical Engineering were formed. This left Messrs. Wilson, Morrison, Robb and Fife to teach the Civil Engineering curriculum which was essentially as shown in Table 1. In 1922 Mr. Fife left to study for a M.Sc. degree at MIT. In 1923 he was replaced by Mr. Harry R. Webb who received the first M.Sc. awarded by this University in Civil Engineering in 1922 for a thesis entitled: "An Investigation to Determine the Concrete Making Properties of Certain Aggregates in Local Use at Edmonton, Alberta."

With two major exceptions, the Department remained unchanged until the mid-1940's. The staff complement increased from 4 to 5 in 1931 when Robert M. Hardy joined the Department as a Sessional Lecturer. The next major change came with the retirement of James Adam in 1938 at which time the Department of Drawing and Descriptive Geometry was closed and these duties were transferred back to the Department of Civil and Municipal Engineering. Mr. William W. Preston joined the Department in 1938 and taught these subjects until his retirement in 1973. In the early 1930's Professor Morrison organized and taught the first courses at a Canadian university in the field of soil mechanics. During this period the annual graduating class in Civil Engineering ranged from 2 to 10 persons as shown in Table 3.

In 1929 Professor Wilson became Dean of the Faculty of Applied Science while continuing as Professor and Head of the Department of Civil and Municipal Engineering. He held these positions until he retired in 1946.

In the 1940's Leroy A. Thorssen, Fred McPherson, George Ford, Ralph McManus, Leonard Gads, Jack Longworth, Stewart Sinclair, Thomas Blench and Patrick Bouthillier all joined the Department. Professor Bouthillier was the last of this group to serve the Department. He retired in 1987 after 40 years in the Faculty. Each of these persons made a lasting contribution to the Department and the Faculty. In addition a large number of sessional lecturers joined the Department for one or more years before moving on to jobs elsewhere (see Table 2). In 1947 Professor Hardy became Dean of the Faculty of Engineering. He continued as Head of Civil Engineering until 1959. From 1949 until 1959 Professor Ford served as Secretary of the Department.

Immediately after World War II the number of students grew rapidly as veterans returned home. The graduating class in Civil Engineering reached 87 in 1950, a number not exceeded until 1977 (Table 3).

The next major growth period came in the late 1950's and early 1960's. A quarter of the current academic staff joined the Department during this period. Other spurts of growth occurred in the late 1970's and again with the advent of the Cooperative Education program in the 1980's.

Professor S.R. Sinclair became Head of the Department of Civil and Municipal Engineering in 1959, a position he held until 1973. In 1959 the name of the depart-

ment was shortened to Department of Civil Engineering. Professor G.L. Kulak succeeded Professor Sinclair as Chairman of the Department (1973-1976). He was succeeded by Professors J. Longworth (1976-1979), J.P. Verschuren (1979-1982), D.W. Murray (1982-1987) and J.G. MacGregor. Professor Murray appointed Professors P.H. Bouthillier and E.L. Fowler as Associate Chairmen. They were replaced in 1987 by Professors R. Gerard and D.C. Sego.

As mentioned earlier the first M.Sc. degree in Civil Engineering was awarded in 1922 to H.R. Webb who subsequently served on the faculty for twenty years. The next four Masters degrees were awarded in 1946 to R.W. Brandley, E. D'Appolonia and to G. Ford and R.N. McManus. Ford and McManus co-authored a thesis on "An Analysis of an Arch Supported Continuous Girder." Two more M.Sc. degrees were awarded in 1947, one based in part on another co-authored thesis, this time by R.A. Hemstock and S.R. Sinclair.

The year 1963 marked the first Ph.D.'s awarded in Civil Engineering. These went to Ralph W. Ansley, a member of the staff from 1959 to 1965 and to Stan Thomson, now a Professor Emeritus in the Department.

The Master of Engineering degree was introduced in 1967-68 as a non-research degree for engineers entering practice. In place of a thesis, candidates wrote a project report, generally on a design project. Nine M.Eng. degrees were awarded in 1968.

To date (January 1988) 105 Ph.D. degrees, 417 M.Sc. degrees and 194 M.Eng. degrees in Civil Engineering have been awarded by this University.

Originally the Department of Civil and Municipal Engineerng was housed in Athabasca Hall. Later it moved to the South Lab, the long narrow two story building located between the present Cameron Library and the Power Plant. In the summer of 1953 the Engineering Building, now the Civil Engineering wing of the Civil-Electrical Building, opened. It housed Chemical, Civil and Petroleum Engineering and Mathematics. A new wing for Electrical Engineering was added in 1959. Chemical Engineering moved out when their building was completed in 1968.

The T. Blench Laboratory, dedicated to research in hydrotechnical engineering was constructed in 1959. The I.F. Morrison Laboratory opened in 1963 for structural engineering research. In the late 1970's the environmental engineering labs were moved from the Civil-Electrical Building to the South Lab. These labs and a portion of the geotechnical labs were moved in 1986 to the newly renovated Newton Research Building (formerly the Alberta Research Council Building). Also in 1986, a series of trailers was erected to house graduate students.

Table 1

Curriculum for B.Sc. in Civil Engineering 1908-1913

Year I

Subject	*Lectures per Week*		*Laboratory etc. Periods per Week*	
	1st Term	*2nd Term*	*1st Term*	*2nd Term*
Algebra	4	4		
Desc. Geometry	1	1	2	1 3/4
Dynamics	2			
Eng. Composition	2	2		
Drawing			2	1 3/4
Geometry	3			
Physics	2	2	1	1
Shopwork	1	1		
Trigonometry		3		
Elem. Surveying				1-2

A laboratory period is three hours

Year II

Subject	*Lectures per Week*		*Laboratory etc. Periods per Week*	
	1st Term	*2nd Term*	*1st Term*	*2nd Term*
Analy. Geometry	3			
Calculus	3	3		
Chemistry	2	2	1	1
Graphical Statics		1		1
Surveying and Mapping			2	
Mech. Drawing				2
Mechanics		3		
Mech. of Machines	2	2		
Physics	2	2	1	
Shopwork			1	1
Surveying	2	2		

Year III

Subject	*Lectures per Week*		*Laboratory etc. Periods per Week*	
	1st Term	*2nd Term*	*1st Term*	*2nd Term*
Desc. Geometry		1		1
Geology	2	2	1	1
Hydraulics	3	2		1
Graphical Statics			2	
Mechanics	2			
Municipal Accounting		1		
Practical Astronomy	2	2		
Strength of Materials	2	2		1
Surveying and Mapping			2	1
Theory of Structures	2	3		

Year IV

Subject	*Lectures per Week*		*Laboratory etc. Periods per Week*	
	1st Term	*2nd Term*	*1st Term*	*2nd Term*
Bacteriology	2		1	
Design		3	2	3
Electrical Engineering	2		1	
Foundat. & Masonry		1		1
Geodesy	2		1	
Mech. Engineering		2		1
Municip. Engineering	2	2		
Public Health		2		1
Railway Engineering	2	2		
Structur. Engineering	1		1	
Testing Laboratory			1	1

Table 2

Academic Staff Department of Civil Engineering

William Muir Edwards	1908-1918	Civil & Municipal Engineering
James Adam	1911-1938[1]	Drafting, Graphical Statics and Descriptive Geometry
Ibrahim Folinsbee Morrison	1912-1954	Structural Engineering and Mechanics
Charles A. Robb	1912-1940	Mechanical Engineering
Cecil S. Burgess	1913-1940[2]	Architecture
Walter Maxwell Fife	1913-1922	Structural Engineering
Alan E. Cameron	1914-1919[3]	Mining Engineering
Hector J. MacLeod	1914-1920[4]	Electrical Engineering
Robert S.L. Wilson	1920-1945[5]	Civil Engineering
Harry R. Webb	1923-1942	Civil Engineering
Carson F. Morrison	1928-1929	Structural Engineering
Adrian Waring Wolfe-Mertin	1929-1931	Civil Engineering
Horace L. Seymour	1929-1931	Town Planning
Robert M. Hardy	1931-1958[5]	Soil Mechanics and Foundations
Alan H. Johnston	1937-1939	Plant Design
Leslie H. McManus	1937-1939, 1943-1947	Highway Engineering
William W. Preston	1939-1973	Drawing and Descriptive Geometry
George Ross	1939-1940	Civil Engineering
Jack D. Sylvester	1939-1940	Civil Engineering
Alexander R. Grieg	1940-1941	Mechanical Engineering
Leroy A. Thorssen	1940-1952	Concrete and Materials
George W. Govier	1941-1963[5, 6]	Chemical Engineering
Fred McPherson	1941-1950	Civil Engineering
Elio D'Appolonia	1944-1946	Soil Mechanics and Foundations
George Ford	1944-1985[5, 7]	Structures and Applied Mechanics

Allan D. Hogg	1944-1945	Mechanical Engineering
Ralph N. McManus	1944-1958	Structural Engineering
Dudley B. Menzies	1944-1946	Sanitary Engineering
Maurice S. Mitchell	1945-1947	Civil Engineering
James A. Brown	1946-1947	Civil Engineering
John William Fead	1946-1947	Civil Engineering
Leonard E. Gads	1946-1971	Surveying and Astronomy
Henry L. Kasten	1946-1947, 1949-1953	Structural Engineering
Edwin K. Cumming	1947-1948	Mechanical Engineering
Jack W. Forster	1947-1948	Civil Engineering
Jack Longworth	1947-1982	Structural Engineering
Murdo Murchison	1947-1948	Civil Engineering
David Panar	1947-1968[7]	Mechanical Engineering
Gerald W. Sadler	1947- [7]	Mechanical Engineering
Stewart R. Sinclair	1947-1976	Soil Mechanics and Foundations, Head
Benjamin B. Torchinski	1947-1949	Soil Mechanics and Foundations
Thomas Blench	1948-1969	Hydraulics and River Engineering
Patrick H. Bouthillier	1948-1987	Sanitary Engineering
John A. Randle	1948-1950	Civil Engineering
Norman L. Reid	1950-1951	Civil Engineering
Philip J. Rivard	1950-1951	Civil Engineering
Allan W. Peterson	1953-1987	Hydraulics and River Engineering
William Jubian	1954-1955	Civil Engineering
Harold R. McArthur	1955-1960	Civil Engineering
Jac P. Verschuren	1955-	Hydrology
J. Stewart Kennedy	1956- [7]	Applied Mechanics
Kenneth O. Anderson	1957-	Pavement Materials
Walter L. Bigg[3]	1957-1973	Surveying
Sieg Brunning	1957-1958	Transportation
Elmer W. Brooker	1957-1968	Soil Mechanics and Foundations
Antonio J. Celis	1957-1958	Civil Engineering
John Duby	1957-1958	Applied Mechanics
Peter Glockner	1957-1960	Structural Engineering
Sidney H. Simmonds	1957-	Structural Engineering
Walter H. Stilwell	1957-1960	Civil Engineering
Ralph Ansley	1959-1965	Hydraulic Engineering
John J. Bakker	1959-	Transportation Engineering
Mark J. Baron	1959-1965	Structural Engineering
Peter F. Adams	1960-1976[5]	Structural Engineering

[1]Department of Drawing and Descriptive Geometry formed in 1919
[2]Department of Architecture formed in 1913
[3]Mining Engineering Department formed in 1919
[4]Electrical Engineering Department formed in 1914
[5]Became Dean of Engineering
[6]Chemical Engineering Department formed in 1946
[7]Mechanical Engineering Department formed in 1959

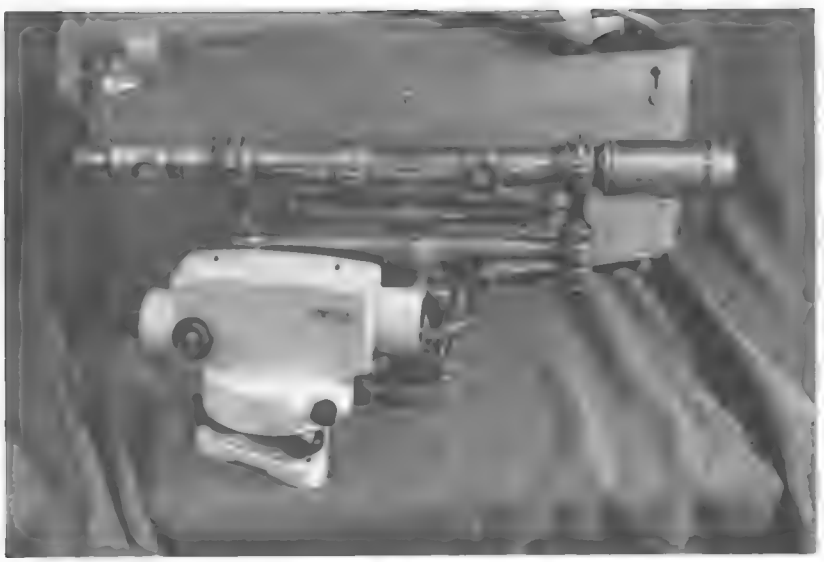
Eldon L. Fowler	1960-1987	Concrete Materials
James G. MacGregor	1960-	Structural Engineering
David W. Murray	1960-	Structural Engineering
John Nuttall	1960-1973	Hydrotechnical Engineering
Stan Thomson	1960-1984	Geotechnical Engineering
Joseph Warwaruk	1960-	Structural Engineering
N. Rajaratnam	1966-	Hydrotechnical Engineering
Norbert R. Morgenstern	1968-	Geotechnical Engineering
Rolf Kellerhals	1969-1972	Hydrotechnical Engineering
Geoffrey L. Kulak	1969-	Structural Engineering
David M. Cruden	1971-	Engineering Geology (Joint Appointment)
Zdenek Eisenstein	1971-	Geotechnical Engineering
P.W. Bell	1972-1974	Hydrotechnical Engineering
Gordon Wormsbecker	1973-	Graphics
Garry Parker	1974-1980	Hydrotechnical Engineering
Stan Teply	1974-	Transportation Engineering
Steven E. Hrudey	1975-	Environmental Engineering
Reidar Bjorhovde	1976-1981	Structural Engineering
Terry M. Hrudey	1976-	Structural Engineering
R. (Larry) Gerard	1977-	Hydrotechnical Engineering
Peter Kaiser	1977-1987	Geotechnical Engineering
C. James Montgomery	1977-1981	Structural Engineering
David C. Sego	1977-	Geotechnical Engineering
Daniel W. Smith	1978-	Environmental Engineering
J. Donald Scott	1980-	Geotechnical Engineering
Peter M. Huck	1981-	Environmental Engineering
Ian Jollife	1981-1983	Hydrotechnical Engineering
Andrew Scanlon	1981-1987	Structural Engineering
Alaa E. Elwi	1982-	Structural Engineering
D.J. Laurie Kennedy	1982-	Structural Engineering
J. Douglas Hunt	1983-	Transportation Engineering
Peter Steffler	1983-	Hydrotechnical Engineering
J.J. (Roger) Cheng	1984-	Structural Engineering
David H. Chan	1984-	Geotechnical Engineering
S. Peter Dozzi	1984-	Construction Engineering
William A. Weir	1985-	Construction Engineering

Table 3

Degrees in Civil Engineering

Year	*BSc*	*MSc*	*Year*	*BSc*	*MSc*	*MEng*	*PhD*
1913	5*		1951	44	2		
1914	2*		1952	38	4		
1915	5*		1953	29	3		
1916	8*		1954	36	3		
1917	-		1955	35	8		
1918	1		1956	56	5		
1919	1		1957	54	1		
1920	7		1958	45	5		
1921	2	1	1959	60	9		
1922	3		1960	66	19		
1923	2		1961	75	7		
1924	3		1962	65	11		
1925	2		1963	64	15	2	
1926	4		1964	53	11		
1927	2		1965	31	20	3	
1928	2		1966	42	18	1	
1929	2		1967	46	14	1	
1930	4		1968	44	16	9	2
1931	7		1969	46	8	7	2
1932	4		1970	48	14	2	6
1933	3		1971	55	9	8	4
1934	10		1972	55	10	5	10
1935	4		1973	71	7	5	8
1936	2		1974	64	9	2	8
1937	6		1975	50	3	7	2
1938	3		1976	63	11	8	1
1939	7		1977	99	12	7	4
1940	10		1978	98	5	4	3
1941	6		1979	106	10	12	6
1942	13		1980	87	10	9	8
1943	17		1981	83	19	13	5
1944	10		1982	83	14	11	3
1945	14		1983	80	16	16	3
1946	17	4	1984	86	19	33	5
1947	25	3	1985	63	18	14	4
1948	40	2	1986	74	15	9	6
1949	59	4	1987	64	19	13	8
1950	87	4					
Total				2654	417	194	105

* Degree called B.Sc. in Applied Science



The Old and the New

I.F. Morrison Structural Engineering Laboratory - Test of a slender column for Strength of Materials Laboratory

Graduate Environmental Engineering Laboratory

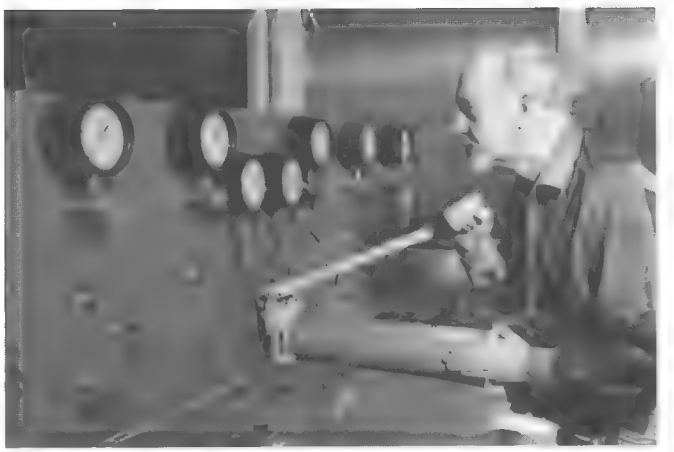
Baldwin Universal Testing Machine, Strength of Materials Laboratory

Concrete cylinder test

Triaxial Compression Text of a soil sample Mr. Andrew Barr, Class of '88

First Year Engineering AUTOCAD Drafting Laboratory

Gas Chromatograph in Environmental Engineering Laboratories



Triaxial Rock Mechanics Testing Apparatus

Computer Controls for High Pressure, High Temperature Tests of Tar Sands

Electrical

Electrical Engineering

By D.H. Kelly

Electrical engineering students at the University of Alberta were complaining of too much work three years before the Department was formally created in 1925. Between October 26, 1914 (when Electrical Engineering was officially recognized as a division of the Department of Physics) and 1922, there were never more than five Electrical Engineering students, and, with three faculty members (Boyle, Smith and MacLeod) they appear to have been special-case, hard-working physicists. In that year (1922) Boyle, then the Dean of Applied Science, reported that 62 hours study a week was rather a heavy load for these students. Mechanical drawing (EE56) was dropped from the syllabus and other changes were made, leaving 27 to 30 lecture and laboratory hours in each week. By the end of 1922 the third year of electrical engineering was well established. Two final year students had gone to the University of Manitoba and the Faculty of Applied Science foresaw a viable department in the making. With seven third year students and two in Engineering Physics, the Faculty strength was increased to four in 1923 and fourth year electrical courses were introduced. Although each student appears to have been judged on an individual basis, the Faculty formally decided that a degree involving Electrical Engineering or Engineering Physics required four years from senior matriculation (Grade 13) and five years from junior matriculation (Grade 12). Engineering Physics, for example, would require three years in Arts or Applied Science "with demonstrated ability" followed by a two year program in senior Electrical Engineering, Physics and Mathematics courses. A one-year M.Sc. program was introduced at the same time, with at least one Mathematics and one Physics course required. Third and fourth year had a combined total of 13 students by 1924, when an Electrical Engineering student (E.H. Gowan) won a Rhodes Scholarship, the first Alberta science student (as the University described him) to do so.

From 1925 (the Department was officially created on September 1st of that year) to 1935 few records were kept by the Department; the faculty size remained constant (3 or 4) and, in 1931, there were seven graduates.[1] The capital budget had grown to $500 a year. Ward Porteous joined the staff in 1931. CKUA radio introduced crystal frequency control for its 500W transmitter; the radio station and an electrical

[1] At the April 9, 1914 meeting of the Council of the Faculty of Applied Science a motion by Edwards and Boyle recommended the establishment of a Department of Electrical Engineering to provide service courses in Electrical Engineering for the students in the Faculty. The first degrees in Electrical Engineering were granted to six students at the Spring convocation of 1924.

machine (in Assiniboia Hall) were the laboratories for students, who still made (and this would continue until the 1940's) extensive use of facilities in the Physics Department. In 1933, with MacLeod, Cornish and Porteous (who had just received the first Master's degree in Electrical Engineering awarded by the University) as the staff, there were 14 graduates. In 1934 a graduating thesis requirement was introduced. It was still a small, very closely-knit department in a college environment. In fact, during the 1930's there was great concern about approving the right text books, publishing examinations papers and monitoring tests and examinations. Perhaps it was the small size of the Department, or its close association with Physics, or a combination of both, but anyone reading the scant records of that era would be impressed by the degree of concern the staff had for the welfare of those few students. It was justified then and still is. In the early 1930's electronic design courses were introduced into the five year program. By 1938 design courses were firmly established and a 'mix' of the essential aspects of analysis and synthesis had been achieved.

In 1938 Cullwick became Head after the resignation (in 1937) of MacLeod. Fourth year had dropped to eight graduates but, three years later, Electrical Engineering would reach a unforeseen enrolment of about 100 students in special electronic courses, an enrolment level which would not occur again in any course or program until the late fifties.

Additional funds were received (in January 1941) to start a "Special Course in Short Wave and Ultra Short Wave Radio". This was "a course of definite national importance since men with knowledge of Short Wave theory and practice were urgently needed". The University had responded to a visit from Great Britain's Scientific Liaison Officer, (then) Professor R.H. Fowler, FRS. One of the first students to take this course was R.E. Phillips, past Vice-President, Facilities and Services.

Additional space followed. So did additional courses for radio mechanics (RM's) from the Department of National Defense for Air. During one 14-week period, summer courses were given to 120 RM's in the RCAF; in total the three Electrical Engineering staff (with the traditional help from Physics) trained 200 people at a time. In 1942, 100 Artificer Apprentices were also trained; the photographic records of the University show the immense amount of work that went into electronic training during this period and the extent to which the workload, the equipment and the facilities in the Faculty of Applied Science were shared for the war effort training.

At the end of 1942 Phillips and Waghorne (Queen's) joined the staff; Cullwick went on leave to become Director of Electrical Engineering at Naval Service HQ, Ottawa and Cornish (who died the following year) became Head. Anticipating an influx of students after the war was over, the Department prepared to expand its programs.

In 1944 two distinct third and fourth year options were introduced; power and electronic/communications. The majority of the Department's facilities were in the Power House and, although detailed records are again not available, it is probable that the number of graduates increased to about 60 each year by 1948 with a staff of nine. Porteous (who would, for a total of three decades, have an immense impact on the Department) became Head in 1945, to be followed by Harle in 1947. By 1948

the staff included D. Panar and R. King[2], the latter retiring in 1983 after 35 years of dedicated service.

Although the operation of CKUA radio station was taken over by Alberta Government Telephones in 1945, it continued to be a major facility for the Department for several more years. The radio station provided the first link in Canada from university to school and participated in the first trans-Canada school broadcasting system (1930)[3]. Its technical operation is recorded in the Department's first two M.Sc. theses;[4] further it had provided an essential training facility for men in the Canadian armed services - men who came back to study during the following ten years. It was to remain the only visible research facility until the installation, in 1958, of the Brown-Boveri Network Analyzer, a gift from Calgary Power and the first Canadian power research facility of its kind. From 60 graduating students in 1948/49, class sizes varied but on the average declined over the ten years following the end of the war: only 43 students in total were registered in Electrical Engineering in 1951/52, in 1955 there were 17 fourth year students, none of them in Engineering Physics, and only one graduate student, Dr. D.H. Kelly, presently Associate Chairman of the Department.

By 1958 enrolment began to increase again; power and control engineering research became established, the latter due to Professor Y.J. Kingma. Several of the present staff were students in the Engineering Physics program which had become and was to remain for twenty years a major 'option' in Electrical Engineering.

Dr. G.B. Walker became Department Head in 1964. There were 113 students in total and ten staff. The following years were to see the fastest expansion of graduate and faculty research in any Electrical Engineering department in Canada. Within five years the staff had increased to 23, with an additional three PDFs. Almost every aspect of electrical engineering was taught at a graduate or undergraduate level and the areas of power, control and electronics were balanced by a new emphasis on plasma and laser physics. The years 1964-71 were significant for several reasons. A "critical mass" had been achieved for teaching and research. A wide range of research work was published. Linkages with industry and the Provincial and Federal governments were established. As a result of these years of intense activity, the Department would receive, in 1972, as its first major grant a $638,000 negotiated development grant for laser and plasma physics involving nine faculty members, with significant capital and operating grants to another 10 faculty members over a wide range of subjects. Research funding tripled in the next 10 years.

The Department was well established when Dr. C.R. James became Chairman in 1974. Dr. James resigned in 1987 to become Vice-President (Research) and was succeeded by Dr. P.R. Smy. The period from 1974 to the present has been one of considerable expansion, particularly in microelectronics along with the strengthen-

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[2] It is almost certain that Professor King had taught, in total, more courses than anyone else at the University of Alberta: one particular year records show him as being responsible for the instruction of nine courses associated with power engineering.

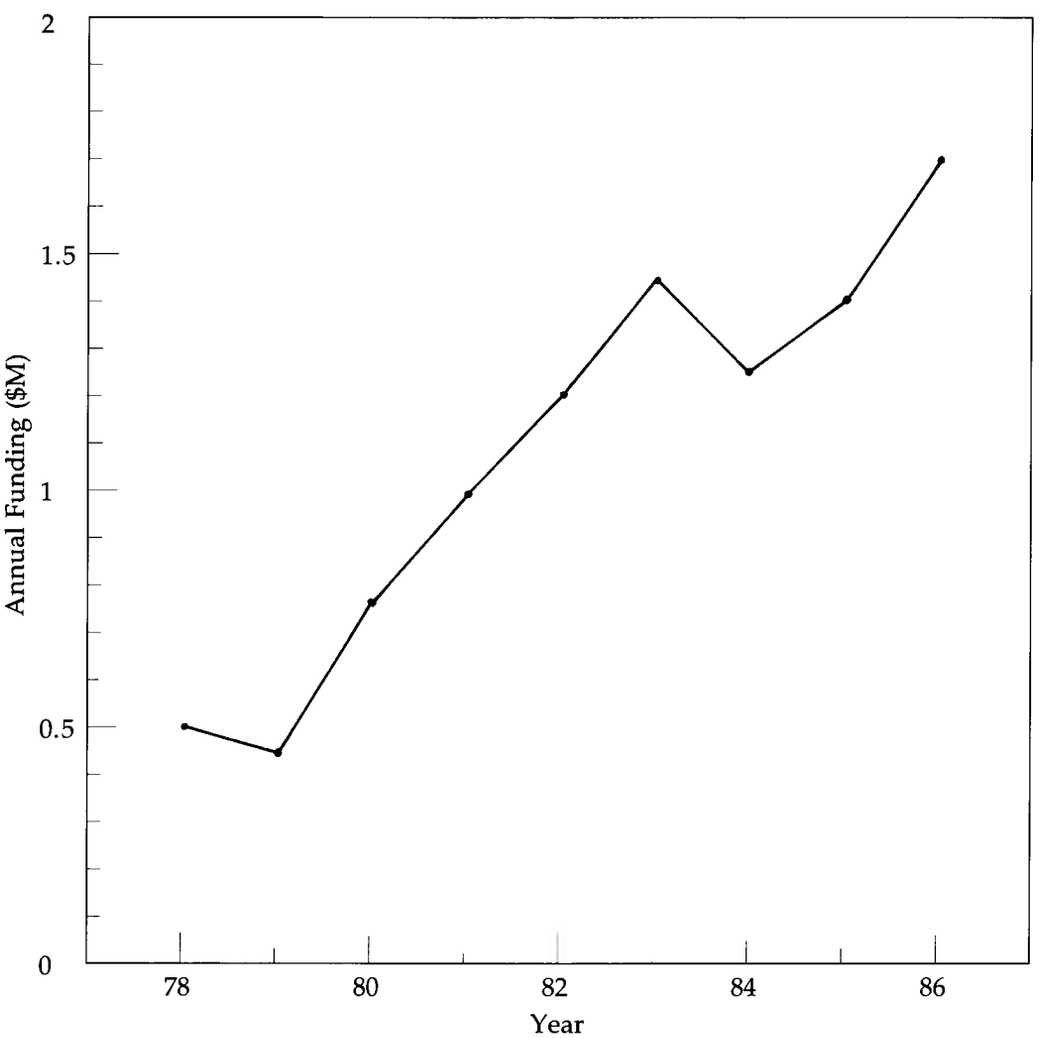
[3] The founders of CKUA included A.E. Corbett and Donald Cameron; experimental "extension" broadcasts began in 1925 and the operation of CKUA was regarded as Electrical Engineering's major contribution to the Province for about 20 years. For a history, see the Porteous Papers and Cornish Publications (Archives 69-116, 70-116-1).

[4] J.W. Porteous 1933, W.E. Cornish 1935.

ing and consolidation of other areas. The accompanying graph shows, as an example, the growth over the last decade of NSERC assistance to departmental research.

In the past few years, a number of initiatives have been taken to expand and improve contacts with industry and government on the basis that a viable engineering department cannot exist in isolation but must be involved with engineering practice. As part of this involvement, the Department is associated with services to industry, mainly channelled through the Alberta Laser Institute, the Alberta Microelectronics Centre and the Alberta Telecommunications Research Centre. Currently, the Department is the second largest in Canada having over five hundred students and seventy staff (including forty faculty).

NSERC Funding to the Department of Electrical Engineering Over the Last Decade



BSc in Electrical Engineering Degrees Granted

Year	*Spring Convocation*	*Fall Convocation*
1924	6	
1925	4	
1926	2	
1927	4	
1928	10	
1929	9	
1930	5	
1931	7	
1932	8	
1933	14	
1934	16	
1935	16 (1st female graduate in engineering)	
1936	19	
1937	13	
1938	8	
1939	14	
1940	7	
1941	14	
1942	5	
1943	14	
1944	13	
1945	16	
1946	27	
1947	12	4
1948	29	-
1949	47	4
1950	63	10
1951	34	11
1952	17	3
1953	9	1
1954	17	0
1955	16	2
1956	24	-
1957	19	3
1958	24	1
1959	29	4
1960	39	6
1961	52	5
1962	64	15
1963	35	4
1964	46	8
1965	35	7
1966	39	4
1967	35	3
1968	49	3
1969	47	2

Year	*Spring Convocation*	*Fall Convocation*
1970	58	1
1971	71	5
1972	60	3
1973	60	3
1974	75	4
1975	77	2
1976	42	5
1977	45	5
1978	42	1
1979	56	9
1980	59	10
1981	72	2
1982	73	4
1983	45	8
1984	60	8
1985	70	5
1986	78	5
1987	91	8

The Alberta Laser Institute

The Alberta Laser Applications and Engineering Research Institute, more commonly known as the Alberta Laser Institute was established in 1985 as a non-profit company wholly owned by the University of Alberta. Start-up funding has been provided by the Department of Technology, Research, and Telecommunications of the Province of Alberta, and the Department of Regional Industrial Expansion of the Government of Canada.

The mandate of the Alberta Laser Institute is to improve the competitiveness of present industries and to promote the diversification into new products and areas of manufacturing, by the transfer of laser technology.
Services offered by the Alberta Laser Institute include:

Laser Processing Technology
The Alberta Laser Institute offers a variety of material processing applications, including welding, heat treating, cutting and overlaying or cladding. The advantages of laser welding include the narrow heat affected zone, as well as the rate at which the welds are made. As a result, laser welding may be more efficient, viable and cost effective than other welding processes. The controllable case depths and limited distortion of the workpiece make laser heat treating more attractive than the conventional methods. The laser process also reduces post-treatment machining of heat-treated products. Laser overlaying or cladding operation...building up of the workpiece by adding material...can be used to enhance the wear or corrosion resistance of easy-to-fabricate materials. Laser cutting provides an accurate, high quality cut with narrow kerf and minimum heat affected zone. These features make laser cutting a popular application in industry.

The Alberta Laser Institute has a CE-5000 Laser and LPC-8 Five axis CNC Workstation, from Combustion Engineering Industrial Lasers, Somerville Mass., a CE-1000 Laser with a flat-bed CNC Workstation, and A Computer Aided Design workstation hard-linked to the laser processing stations.

Technical and Economic Feasibility of Laser Processing
The use of lasers in industry in North America is growing at the rate of 25% per year. The Laser Institute can guide industries who are considering the use of this new technology: the Institute can determine the advantages of using lasers as compared with alternative manufacturing techniques; and judge the technical and economic feasibility of laser processing in a particular application.

Application of Lasers in Detection, Metrology and Electronics

Sensors enhance an operator's control. The result is an increase in quality, efficiency and reliability of production. Laser sensors can measure temperature, pressure, flow, sound, electric fields, or magnetic fields. They can be used for chemical analysis or detection of substances in the process streams. The measurement is noncontact, or by using fibre optics the sensors can operate in corrosive or explosive environments or in the presence of high voltages or electromagnetic interference. These features make them particularly suited for applications in the petrochemical and energy industries. Small size and inert character make lasers very attractive for medical applications. Sensors may also be a key part in electronic equipment such as compact disc players or manufacturing equipment for microelectronics.

Industrial application of intelligent sensor systems include adaptive welding, quality control, part manipulation and process automation. Specialized sensors have the ability to perform a three-dimensional object analysis that is useful in quality control applications.

The Alberta Laser Institute has a Zimmer 600/10 Proximeter for inspection application and a HP Laser Measurement System. Staff members at the Institute have the capability to design, prototype, debug, and manufacture specialized sensors for particular applications.

Alberta Microelectronics Centre (AMC)

The Alberta Microelectronics Centre is a nonprofit corporation established in 1982 and owned by the University of Alberta. The fabrication facilities are housed in the Robert Newton building on the University of Alberta campus. The design facility is located in Calgary. Initial funding of $5-million over a period of five years was provided by the Department of Industry, Trade, and Commerce of the Government of Canada. Subsequent funding has included: $0.5-million in 1984 by the Government of Canada for a sensor fabrication centre; $14.5-million in 1985 from the Government of Alberta for microchip design facilities in Calgary and fabrication facilities in Edmonton; $26-million in 1985 by the Government of Alberta for a technology transfer agreement with LSI Logic Corporation of Canada for ASIC design and fabrication technology.

The fabrication facility is a gate array double metal finishing plant which can produce microchips with a two micron feature size and up to a 10,000 gate complexity. Production capacity is 100 5-inch-diameter wafers per week.

The design centre offers one of the most modern and advanced computer-aided ASIC design facilities in Canada. Design alternatives include: turnkey designs where the centre completes the entire project; joint designs where a client's engineers perform the IC design using the centre's assistance and equipment; client designs where the centre's CAD tools are rented. Confidentiality is a high priority, and the centre is prepared to sign non-disclosure agreements on all projects.

The microelectronics centre has proven to be an excellent avenue by which graduate students can be trained and newly developed technologies transferred to industry. At the University of Alberta, faculty and graduate students from the Departments of Electrical Engineering, Mechanical Engineering, Chemistry and Mathematics are involved in joint projects with the centre. Research areas include integrated circuit design and fabrication, sensor technology, and integrated manufacturing.

Alberta Telecommunications Research Centre

The Alberta Telecommunications Research Centre (ATRC) is an off-campus research facility conducting applied research in telecommunications. It was incorporated by the University of Alberta in April 1986 as a private nonprofit corporation. ATRC's corporate mission is to:

> "Create and operate a joint university/industry telecommunications research centre that through stimulating research provides: expanded quality education and research for its university sponsors, economic growth for its government sponsors and business growth for its industry sponsors."

ATRC welcomes universities and graduate students on a worldwide basis. Similarly, it welcomes industry on a worldwide basis. By uniting the resources of university and industry, ATRC will help accelerate the development of people and technology to produce economic growth in the telecommunications industry.

University collaboration and cooperation is vital to ATRC's success. Consequently, ATRC's agreement with the University of Alberta emphasizes various professorial association and research awards.

Professorial associations are at three levels: staff professor, affiliate professor and adjunct professor. Each category requires the professor to conduct research and/or supervise graduate students doing research on ATRC premises.

The ATRC awards program was established to attract highly qualified students interested in graduate and postgraduate research in telecommunications. It plays a critical part in the overall staffing plan of the Centre. The following annual scholarships and awards are offered by ATRC:

- ATRC Postdoctoral Telecommunications Research Award
- ATRC Telecommunications Scholarship
- ATRC Telecommunications Fellowship
- ATRC Undergraduate Student Award

Currently the ATRC applied research program is organized into four interrelated areas reflecting developments in the telecommunications industry.

Network Access Technologies
Advanced Network Technologies

Advanced Transmission Technologies
Advanced Circuit and Software Technologies

University participants have a royalty-free right to all technical information derived from the program for research and educational purposes.

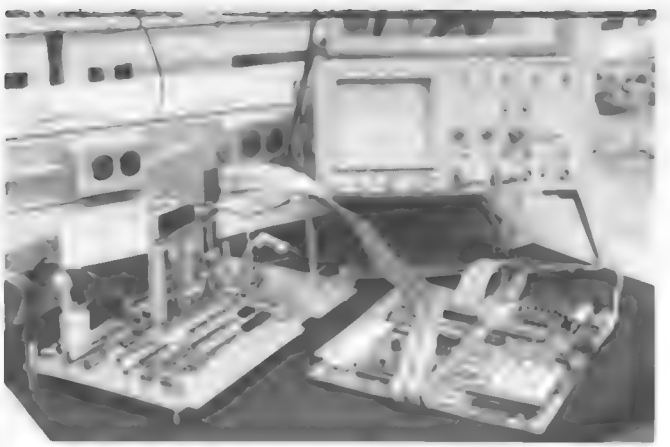
ATRC's motto "People and Technology for the Future" exemplifies the commitment to establishing a world class centre of excellence in telecommunications and education by developing advanced innovative technologies.

Microwave generation of plasma sheets in the Microwave Power Engineering Group

Mass spectrometer used for analysis of CO_2 Laser gases in Medical Industrial Laser Lab

300 KV high voltage research facility

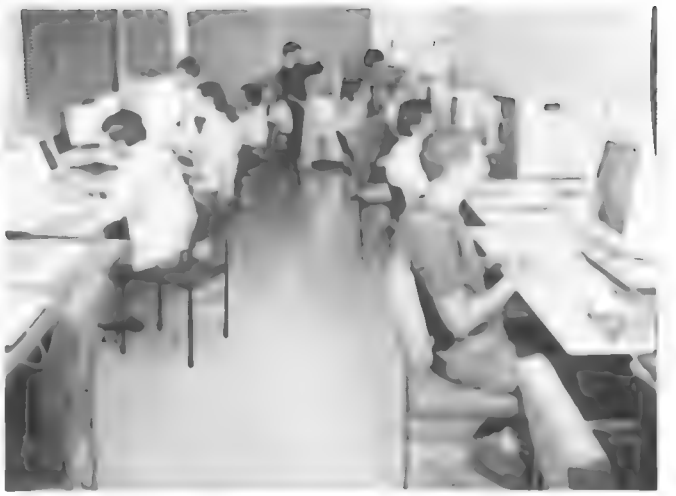
Portion of KrF laser system showing laser modules, auxiliary optics and high pressure gas pipes used for converting long pulses into short pulses.



Motor/Generator test set in undergraduate Motor Lab.

MSc Research project on implementation of Read-Solomon error correcting code for digital data transmission

High Power Laser Research Group's 10 KW CO_2 PIE LASER.



2nd year Electrical Engineering electronics student lab.

Computer aided design of integrated circuits in Computer Engineering Lab.

Programmable microsurface lathe with 1 microinch resolution produces precision optical surfaces unobtainable by standard optical techniques.

Mechanical

Mechanical Engineering

By M.G. Faulkner

Although Mechanical Engineering was not formally introduced at the University of Alberta until 1959, it has steadily increased in size until it is now one of the largest in the country. When the Department was originally formed a nucleus of eight faculty were assembled from the Applied Mechanics Division of Civil Engineering and the Heat and Power Division of Electrical Engineering under the chairmanship of Dr. George Ford. When students entered the program in 1958 (they had completed two years of study) the program was not formally approved; however, the first class did graduate in 1960.

The original faculty included J. Duby (mechanics), D. Panar (thermoscience), G.W. Sadler (thermoscience), J.S. Kennedy (applied mechanics), J.B. Haddow (applied mechanics), E.W. Johnson (mechanics of machines) and C.M. Rodkiewicz (thermoscience). The rapid increase in graduates and the coupled increase in faculty members is shown in Figure 1. It is also noteworthy that simultaneously with the start of the undergraduate program, graduate studies were begun so that the first M.Sc. was awarded in 1960 as well. The growth of the graduate program is also shown in Figure 1 where the number of advanced degrees awarded is plotted chronologically. During the initial years the Departmental offices were in the Civil/Electrical Building while the labs were scattered into space which generally no one else could utilize. The machine shop, materials testing and engine labs were in the Old Power Plant while the gas turbine was a mile away in the new University Power Plant behind the Nurses' Residence. It would take several years until the staff, students and labs could be drawn together to facilitate the development of the Department.

Just as the faculty was drawn from Civil and Electrical Engineering, so was the curriculum a blend of civil and electrical engineering courses to which a measured amount of new mechanical engineering topics was added. For the undergraduates who entered in 1958, the engineering courses included fluid mechanics, structural design and water power from civil as well as thermodynamics, circuits and electrical machines from electrical. Very quickly courses in combustion, heat transfer, advanced strength of materials, mechanics of machines and vibrations were added to the core of the program. As many courses as possible, including most of the options, were taken from other departments to ease the load on the small staff. In general as the complement of faculty grew, the Department began to offer more specific courses to its own students. The addition of A. Eshel and G.S.H. Lock strengthened the thermosciences while K.C. Cheng and D.G. Bellow added to the capabilities in the solid mechanics and design areas. While the departmental offerings increased

the blending of courses from various departments into the program continues to the present. Students still have courses from all the other engineering departments in their core and are encouraged to take many of their options from different disciplines.

The fact that Mechanical Engineering at University of Alberta began much later than at most other Canadian universities meant it was not as bound by tradition. This meant that it was easier to introduce new concepts in instruction and in the way in which the curriculum was structured. It became one of the first departments in Canada to offer an entire course in mechanical vibrations. The introduction of a measurements course changed the traditional technique of offering a laboratory associated with each lecture subject. Courses in statistical thermodynamics and advanced heat transfer made the curriculum one of the most forward looking in the country. The last half of the '60's saw the addition of several faculty, which expanded the technical capabilities of the department. This included D.J. Marsden (aerodynamics), J.R. Colbourne (solid mechanics/mechanisms), A. Craggs (acoustics), J.D. Dale (combustion), and M.G. Faulkner (solid mechanics). Also by this time there was the realization that mechanical engineers needed more appreciation of the role of economics and management in the design and implementation of engineering projects. As a result a core course in engineering economics was developed when J.C. Sprague joined the Department. The Department now had a sufficient complement of faculty and staff to offer an excellent core of mechanical engineering courses that could be enriched by specialized options e.g. aerodynamics, combustion, acoustics and engineering management.

The 1970's saw the Department continue to strengthen its basic groups. There were additions to the thermoscience-fluid mechanics group, R.R. Gilpin, D.J. Wilson and later E.M. Gates and T. Forest. The solid mechanics and mechanical design streams added J.E. Lenard, A. Mioduchowski, J. Jones and then D.R. Budney. The engineering management area was augmented with the coming of J.D. Whittaker. As seen in Figure 1, this brought the total faculty complement to 21 by 1980. George Ford left the Department to become Dean of Engineering in 1971. During the period from 1958 until 1971 he saw the Department grow from 8 to 17 faculty members, increase its graduating class from 20 to well above 70 per year and to see the graduate student enrolment increase tenfold from 4 to 40. The second Chairman, J.S. Kennedy, guided the Department until 1975 when D.G. Bellow took the job and remained in it until 1984.

The 1980's brought two major changes to the structure and development of the Department. These were the introduction of quotas in each of the engineering disciplines and the start of an undergraduate cooperative engineering program in conjunction with the regular traditional one. The introduction of a quota, which actually was introduced in 1975, served to stabilize the undergraduate enrolment as it limited the number of students entering second year mechanical engineering to 115. This meant that more precise planning in terms of space and human resources could be done. The second event, which influenced the departmental operations was the introduction of a cooperative work program which was introduced first into mechanical engineering in 1981. This program allows students 20 months of work experience (two 8 month and one 4 month segments) during the 3rd and 4th years of their academic program. This program, of course, required additional teaching resources because certain courses would have to be offered twice during an academic session. This allowed the Department to add F. Ellyin (applied mechanics/

materials), M.D. Checkel (combustion/fluid mechanics), R.W. Toogood (numerical methods/robotics), B.W. Simms (engineering management) and A.W. Lipsett (structural dynamics). The latest additions to the faculty include R.L. Varty in experimental fluid dynamics and W.H. Finlay in numerical fluid dynamics which brings the current total to 25. The current chairman, M.G. Faulkner, has been in this position since 1984.

One of the major influences in all levels of instruction has been the tremendous changes in numerical computers. While the mechanical engineering students became familiar with computing in 1960's, the availability and flexibility of personal computers has and is altering the methods of instruction. The slide rule was replaced by pocket calculators which are being replaced by personal computers. The undergraduate and graduate curriculula, while retaining the basic concepts, now can be illustrated, augmented and enhanced by the use of computing packages, computer driven experiments and development of sophisticated software which allows decisions which formerly took days to be made in seconds. The Department now uses computers in every aspect of its operations from word processing to large scale numerical computations and will continue to use this tool in every aspect of the educational process. New courses in robotics, numerical analysis and engineering management are based on computers while almost every research project uses them from data acquisition to the basis for numerical investigations.

During its relatively short history the Department has occupied many and different types of facilities including old huts, basements and generally space which was not required by other faculties or departments. The continued growth of the mechanical engineering program, however, made it evident that this piecemeal space could not provide the proper situation for study and research. As a result a new building was planned and finally occupied in 1972. This building has 6,970 m^2 (75,000 sq. ft.) and houses the majority of the teaching and research needs of the Department. It is certainly true that the development of this unique facility is the single most important factor in the evolution of the teaching and research done within the Department.

The building is unique in that it was designed specifically for Mechanical Engineering and embodies a philosophy of flexibility in its design while maintaining a sense of space and openness. The labs, offices, classrooms and shops are all very accessible and are meant to encourage experimentation in teaching and in the facilities which are developed for research. This, it is believed, would allow students, faculty and staff not to feel confined or limited in their approaches to teaching or research. Many of the major research facilities which are now housed in the building were not even envisioned when it was first conceived. The flexibility and availability of the space has resulted in the development of a strong emphasis on experimental work and laboratory experience in both teaching and research. The major research facilities include:

- a materials engineering laboratory which can statically and dynamically evaluate materials or components
- a shock and vibration lab for vibration studies using impact or steady state excitation
- a water channel for visualization and measurements of fluid phenomena

- three cold rooms for continuous studies at temperatures to -60°C
- a wind tunnel for low to medium speed aerodynamic applications
- a marine icing wind tunnel to study the growth of ice in a cold, salt spray environment
- a complete machine shop for the design and construction of equipment and test specimens
- a micro-computer lab with a network of personal computers and output devices.

The Department also operates two major off-campus facilities - the Alberta Home Heating Research Facility (AHHRF) and the Mechanical Engineering Acoustics and Noise Unit (MEANU). The AHHRF was constructed in 1979 and consists of six single story modules each 49 square meters in floor area and with full concrete basements. The modules, which are electrically heated and uninhabited, are located on the University of Alberta farm at Ellerslie. The facility was designed to test several alternative heating and conservation strategies in a northern climate. Each of the modules was designed with a different heating or conservation strategy and they include a standard construction to be compared to the others which range from systems using a passive solar approach to an active air method. Modifications including heat pumps, retrofitting and use of natural gas furnaces have all been evaluated in this facility.

The MEANU is a self-contained acoustical testing facility which sits on approximately 1.6 ha of land about 10 km southeast of the campus. The acquisition of this facility in August 1984 has allowed the development of a unique blend of industrial, educational and research activities. This lab, which is the only true acoustical testing facility operated by a university in Canada, has become active in assisting industries in meeting acoustical standards for their products and has allowed students to become directly involved in industrial projects. The current research involves techniques for the prediction of absorption properties of materials, development of software for sound attenuation predictions in ducts and mufflers as well as investigations of newer techniques for measurement of acoustical properties e.g. sound intensity. The fact that commercial and educational functions are fully integrated and the fact that the facility is run under the auspices of the university make it attractive to industrial clients.

As previously mentioned the Department has been involved with graduate programs from its very beginning. This was possible as the original faculty came from existing departments. The first students in the graduate program were in the engineering mechanics area and did their research in elasticity, plasticity and stability. However, with the strengthening of the thermoscience group, studies in combustion, free and forced convection and phase change effects in heat conduction were done. Due to its obvious local applications some preliminary work on ice formation in pipes was also begun. Research in rarefied gas dynamics and more generally fluid mechanics were begun after specialized wind tunnels were developed.

With the construction of the new Mechanical Engineering building in 1972 the opportunities for expansion of research efforts was possible. The studies of ice formation were expanded through the design of cold rooms, a low temperature

wind tunnel, two-phase thermosyphons and finally a marine icing wind tunnel. The studies of heat transfer in cold regions was expanded to include home heating strategies, moisture migration and effects of air infiltration in building envelopes. The earlier studies in combustion processes were continued to involve the effects of turbulence on flame growth. Fundamental turbulent phenomena were applied to atmospheric dispersion of pollutants and mixing of fluids. The aerodynamics of airfoils applied to propellers, and winglets was possible in the large low speed wind tunnel which was developed in the new building.

The work in applied mechanics was also augmented through the development of a large materials testing area coupled to metrology and shock and vibration labs. Research in the general area of fracture mechanics which was not previously possible has been expanded to include the problems at low temperatures, in hostile environments and for composite materials. The geometry and strength of gear teeth are being studied both theoretically and through experimentation using a gear testing apparatus. The biomechanics of bones and joints along with the development of orthopedic and orthodontic appliances are a more recent trend.

The availability of computing power has allowed more and new types of research activity for graduate studies and staff. Applications of robotics including vision systems and development of command languages are being done using desk-top machines. Large scale computational techniques including finite element and other numerical techniques have been applied to acoustical systems, rotating machinery, wave propagation and computation of secondary flow problems. The microcomputer is also used extensively in the engineering management area for analytical decision making, development of material requirements for manufacturing and production and for the development of integrated management and production techniques.

The graduates with advanced degrees have found excellent opportunities in many of the industrial firms throughout the country. Numerous industries see the value of the advanced studies for people working in sophisticated technically-based organizations. This has led to increased demand for individuals with the experience gained through graduate studies and research in mechanical engineering.

Statistics on Number of Students who have Graduated from Mechanical Engineering

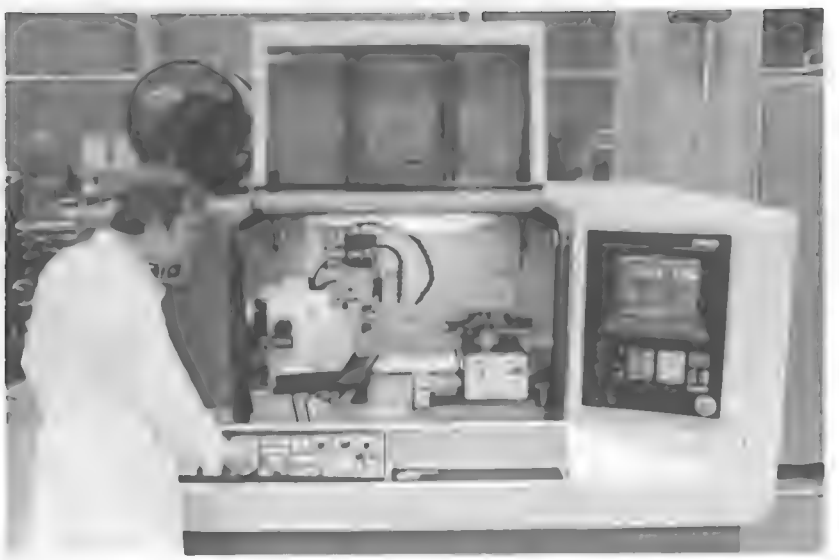
Year	*B.Sc.*	*Co-op*	*M.Eng.*	*M.Sc.*	*Ph.D.*
1960	20	-	-	1	-
1961	34	-	-	-	-
1962	31	-	-	2	-
1963	29	-	-	4	1
1964	51	-	-	2	-
1965	46	-	1	2	1
1966	49	-	-	6	-
1967	45	-	-	6	-
1968	61	-	-	10	1
1969	42	-	1	7	2
1970	49	-	6	7	4
1971	71	-	3	9	3
1972	74	-	3	4	4
1973	79	-	1	5	1

Year	*B.Sc.*	*Co-op*	*M.Eng.*	*M.Sc.*	*Ph.D.*
1974	72	-	4	7	2
1975	46	-	1	2	1
1976	47	-	2	6	1
1977	61	-	4	-	1
1978	71	-	3	2	1
1979	80	-	2	3	2
1980	74	-	2	3	1
1981	102	-	1	0	1
1982	77	-	4	8	-
1983	70	-	2	12	4
1984	60	22	2	4	1
1985	72	27	2	13	2
1986	76	23	-	13	2
1987	64	24	1	8	1
Totals	1653	96	45	146	37

MEANU

The Department of Mechanical Engineering Acoustics and Noise Unit (MEANU) acquired in August, 1984 is located in the Grosvenor Industrial Park. It is the only true acoustical testing facility operated by a university in Canada. It facilitates the commercial development of materials and systems of materials, fundamental research into the acoustical properties of materials, the development of Canadian acoustical standards and the training of scientists and engineers who can assist government and industry in the general area of acoustics and noise control.

A major feature of the MEANU is two reverberation chambers which are constructed to meet or exceed existing testing standards. Associated with this reverberation suite is a workshop area for specimen preparation, instrumentation and control rooms as well as adequate office space to house several individuals. A liaison between the University of Alberta and the National Research Councils' acoustical laboratories in the Division of Building Research establishes the highest level of testing standards.



Advanced technology manufacturing techniques using computer controlled machine tools.

Investigation of new starting aids for diesel engines in arctic conditions.

Materials Engineering testing area.

Alberta Home Heating Facility located near Ellerslie

Specialized Test Facility for noise control products and systems.

Development of programming methods for industrial robots.

Mechanical Engineering I.B.M. P.C. Lab with a 30 station Novell Network.

Computerized measurements of skull parameters for dental applications.

Gear testing apparatus designed and built in the Mechanical Engineering Department.

Low temperature wind tunnel for studies of atmospheric and marine icing.

Mining, Metallurgical and Petroleum

Mining, Metallurgical and Petroleum Engineering

By L.R. Plitt

The teaching of mining and metallurgical engineering at the University of Alberta can be traced back to 1914. In that year, six years after the founding of the University, a 24-year old mining engineering graduate from McGill, Alan Emerson Cameron was appointed as Lecturer in Mining and Demonstrator in Geology. The Department of Geology was already in existence with John A. Allan as Head of the Department. The 1914/15 university calendar lists the Mining Engineering staff as:

John A. Allan	*Professor of Geology*
Alan E. Cameron	*Lecturer*

In this calendar 5 mining-related courses were listed:

Mine Mapping
Mine Design and Ventilation
Mining Survey School
Assaying
Metallurgy

Gordon Kidd, the first applied science graduate who specialized in mining engineering received his B.Sc. in 1916. In 1917/18 Cameron was on active service in England and France with the Royal Canadian Engineers; the mining courses were suspended during this period.

Dr. Tory, the first President of the University, must have recognized the mineral resource potential of Alberta which no doubt prompted the early establishment of the Department of Geology. In 1920 he moved further in this direction by formally establishing the Department of Mining Engineering. The new Department was headed by Norman C. Pitcher (a McGill graduate in mining) who was hired away from Lethbridge Colleries where he was manager. In the same year Dr. Tory established the Alberta Research Council to carry out research to promote the development of Alberta's coal and petroleum resources. A physical chemist named Karl Adolf Clark was one of the first researchers to be recruited by the Council. N.C. Pitcher's role was not only to head up the Mining Department but also to act as a consultant to the Research Council, particularly in the field of coal mining and coal processing.

In 1921 the first engineering graduates appeared with B.Sc.'s in specific engineering disciplines, i.e. civil and mining. Several of the early graduates worked on

projects at the Research Council and received graduate degrees through the Mining Department. The first four M.Sc. recipients and their thesis titles were:

- 1921 Robert T. Hollies, *"Preliminary Investigation on Weathering of Alberta Coals"*
- 1922 John W. Lewis *"Further Investigations on Some of the Properties of Alberta Coals"*
- 1923 Nelles Atkinson *"Carbonizing and Briquetting of Coal"*
- 1924 Sidney M. Blair *"An Investigation of the Bitumen Constituent of the Bituminous Sands of Northern Alberta"*

Dr. Allan, although not a member of the Mining Department after its formal creation in 1920, continued to show a keen interest in the Department. A good number of geology courses were included in the mining curriculum. These courses strengthened the program and were always popular with the students. Many of the more academically inclined students opted to take the geology option, one of three options which by 1922 were offered in mining engineering: coal, metal mining and mining geology.

In 1925 Cameron received a Doctorate in Science in Metallurgy from MIT. Also about this time, he began to introduce more courses in metallurgy, including metallography. In 1930 the Department name was changed to Department of Mining and Metallurgy. The word Engineering was dropped, presumably to keep the name short.

In 1933 a young man from Bruderheim, Alberta, Ewald Oscar Lilge, graduated in Mining Engineering (geology option). He was also the first recipient of the Northern Alberta Branch of CIM Prize. After working in several mines in BC, namely Granby Consolidated Copper Mine at Anyox and BC Nickel at Hope, he returned to the University of Alberta for graduate studies. In 1936, while working on his M.Sc., he was appointed to the professorial staff and was assigned to teach mineral dressing, fire assaying and hydrometallurgy. His M.Sc. thesis was: Occurrence and Recovery of Gold by Cyanide Leaching from the Arsenopyrite Ores from the Lake Athabasca Region. It is interesting to note that with the current interest in gold this thesis would not look out of place in the 1980's. E.O. Lilge was to play an important role in the Department over the next 35 years.

In the mid to late 1930's mining engineering had the largest enrolment of all the branches of engineering at the University. To illustrate, the number of graduates in the various branches are shown in Table 1. The reason for the popularity was that during the depression years the mining industry was one of the few places where engineers could find jobs. In 1937 Cameron moved on to Nova Scotia where he became Deputy Minister of Mines and later President of Nova Scotia Technical College (now the Technical University of Nova Scotia). Karl Clark was then transferred to the Department from the Research Council to teach the physical metallurgy courses. The province had suspended funding of the Research Council during the depression and the staff (Stansfield, Lang and Clark) were put on the University payroll and allowed to continue their research with the limited resources available.

In 1945, Pitcher retired and Karl Clark took over as Department Head. To teach the mining courses Tom Patching, a 1936 graduate, was recruited from Flin Flon. As the World War II veterans returned to University the mining classes swelled to all time high levels, i.e. 51 graduates in 1949. Many of these graduates entered the petroleum industry which grew rapidly following the discovery of oil at Leduc on February 13, 1947. In 1949 the mining-geology program was made a separate degree

program (called Engineering Geology); however, this program was discontinued in 1954 due to the low enrolment. In 1954 Karl Clark retired and E.O. Lilge became Department Head.

With the realization that a Canadian petroleum industry was taking form a program in Petroleum Engineering was established in 1948, with the first degrees being conferred in 1950. The program was implemented by George Govier, then the Head of Chemical Engineering which was renamed the Department of Chemical and Petroleum Engineering. Jack Gregg, a Canadian with an M.Sc. from Berkeley, was hired to teach the petroleum courses. In 1952 a recent U of A graduate, Peter Dranchuk, was hired to assist in teaching the petroleum courses.

During the first decade the petroleum program had graduating classes in the 10-20 per year range. However, in the early 1960's the number of students had dropped to about 6 per year and the B.Sc. program was discontinued in 1963. The graduate program in Petroleum was retained and strengthened, and petroleum engineering courses were offered as options to undergraduates in Chemical and Mechanical Engineering.

Although metallurgy courses had been offered as part of the mining program since the 1920's, it was not until 1956 that a formal separate degree program was initiated. The impetus for this program was the growth of metallurgical activity in the province in the 1950's, e.g. the opening of the Sherritt Gordon nickel refinery at Fort Saskatchewan in 1954, and the opening of the Premier Steel Mill in 1956. The metallurgy program was promoted by an ambitious and talented English metallurgist, James Gordon Parr, who had joined the University of Alberta staff in 1955. Through additional recruiting the metallurgy staff had increased to 4 (Lilge and Jan Leja in mineral processing and extractive metallurgy, Parr and Bill Youdelis in physical metallurgy).

During the first ten years the metallurgy program flourished, particularly at the graduate level. In 1963 the first Ph.D. was awarded by the department (to George Poling whose thesis was: Infrared Studies of Adsorbed Xanthate). In 1964 the number of graduate degrees conferred in metallurgy in one year reached the all-time high of ten. Many of the graduates of this era are now staff members at universities across Canada.

Moves by the metallurgy staff to form their own department, i.e. to split away from mining, led to a period of internal strife. This resulted in the departure of the three recently acquired metallurgy staff members in 1964/5. Thus the late 1960's became a period of rebuilding as new staff were engaged and research programs were re-established.

In 1968 the Mining and Metallurgy Department moved from its historical location in the North Laboratory to the newly constructed building now known as the Chemical-Mineral Engineering Building. The North Lab was then demolished to make room for an expansion of the Cameron library.

On July 1, 1973 the Department of Mineral Engineering was formed from the Department of Mining and Metallurgy and the petroleum division of the Chemical and Petroleum Engineering Department. The original concept proposed by the Faculty of Engineering was that the new Department should offer one degree, i.e. in Mineral Engineering with options in mining, metallurgy and petroleum. The degrees would be Mineral Engineering (Mining), Mineral Engineering (Petroleum), etc. This concept was opposed by all the staff in the new Department; however, only Metallurgy was successful in keeping its program from being a bracketed degree.

A special grant of $1 million (over five years) was also provided by the Department of Advanced Education to help the new Department strengthen its programs, particularly in mining. Through this grant five additional faculty members were added to the department along with technical support staff and laboratory equipment. The B.Sc. program in petroleum engineering, with updated new curriculum, was reinitiated after having been suspended since 1963. In 1979, at the insistence of the Canadian Accreditation Board, the bracketed degrees were abandoned, thus the graduates from 1981 onwards received degrees in Mining Engineering and Petroleum Engineering.

On July 1, 1986 the department name was changed from Mineral Engineering to Mining, Metallurgical and Petroleum Engineering. This change was made as it was found that metallurgy and petroleum were not properly identified with the title Mineral Engineering.

When the new department of Mineral Engineering was formed in 1973, the concept of one degree for the various disciplines was advocated. The thinking was that a general engineering program dealing with the development of mineral resources should be possible, i.e. the unbracketed degree in mineral engineering. This program allowed the students a wide choice of electives among mining, metallurgy and petroleum engineering. In 1978, the Canadian Accreditation Board expressed the opinion the degree was too general and more required courses should be specified. To meet this request required courses were added from the mining and metallurgy programs to create a specialty in what was essentially mineral processing/extractive metallurgy. In 1982 the name of this program was officially changed to Mineral Process Engineering. The general name Mineral Engineering remains to designate the M.Sc. and M.Eng. degrees in mineral processing and oil sands and also the PhD degree in both mining and mineral process engineering.

Professor Patching keeps a record of the activities of the former graduates of the Department. Maintaining a list of over 1000 individuals is a monumental task and the list can never be completely up-to-date. This record has nevertheless been maintained to the present day. The graduation statistics summarized from this list for all the disciplines are shown in Tables 2, 3, 4 & 5. A listing of the academic staff in the departmental disciplines is included in Table 6. At the end of 1987 the cumulative total number of degrees offered in the departmental disciplines was: 1301 B.Sc.'s, 158 M.Sc.'s, 29 M.Eng.'s and 25 Ph.D.'s. Examination of these historical statistics reveals the following:

1 Long lead times are involved in getting programs established, e.g. the B.Sc. program in petroleum engineering was re-started in 1973. Yet not until 1980 did the graduating class exceed 10.

2 The enrolments in these programs are highly cyclical and can often be related to industry activity and the prices of commodities such as copper, gold and oil.

3 The co-existence of several programs in one department tends to dampen some of the fluctuations in overall enrolment, e.g., when mining is down, metallurgy and/or petroleum may be up, etc. As departmental resources can be shifted to some degree from one area to another, this results in overall optimization in the utilization of resources.

Although much emphasis is currently being placed on the promotion of high

technology and manufacturing in Alberta, the mineral resource-based industries will remain of prime importance to the western Canadian economy. Thus the education of engineers to operate and direct these industries will continue to be important for both the Alberta and Canadian economies. The University of Alberta remains the only University in Canada with an undergraduate program in Petroleum Engineering, as compared with 28 universities in the US. Given the importance of this industry to the economy it would seem imperative that the program be nurtured and expanded. In Mining and Mineral Process Engineering the University of Alberta, together with UBC, are the only two universities west of Kingston, Ontario with degree programs. In view of the large scale of mining activities in western and northern Canada, particularly in oil sands and coal, the demand for engineers trained in these fields should continue to grow. The mining industry is also showing an increased awareness of the need for research, thus stimulating the demand for people with graduate degrees. Like many metallurgy departments around the world, the metallurgy division at the University of Alberta is expanding into materials engineering. Plans are being made to introduce a materials options at the B.Sc. level. In addition to metallic materials, this program would include studies in plastics, ceramics and electronic materials. The industrial growth in these fields in the next two decades in expected to be phenomenal. Programs in these fields will permit the young people of our province to participate in these exciting new developments.

Table 1

BSc's Awarded in Engineering 1935-1940

	1935	*1936*	*1937*	*1938*	*1939*	*1940*
Chemical	13	8	8	11	16	8
Civil	4	2	6	3	7	10
Electrica1	6	19	13	9	14	7
Mining	21	20	12	11	19	17
Total	54	49	39	34	61	42

Table 2

Mining Engineering Graduates

Year	*BSc*	*MSc*	*Year*	*BSc*	*MSc*	*MEng*
1916	1		1955	5		
1920	1		1956	7		
1921	3	1	1957	10		
1922	2	1	1958	8		
1923	8	1	1959	7		
1924	4	1	1960	4		
1925	3		1961	6		
1926	3		1962	6		
1927	3		1963	3		
1928	4		1964	2		
1929	5		1965	-		
1930	3		1966	-	1	
1931	10		1967	5		
1932	6		1968	2	1	

Year	*BSc*	*MSc*	*Year*	*BSc*	*MSc*	*MEng*
1933	8	1	1969	2		
1934	10		1970	5		
1935	21		1971	6	1	
1936	20	1	1972	8		
1937	12	1	1973	7		
1938	11		1974	16		
1939	19		1975	4		
1940	17		1976	3+		1
1941	20		1977	2+		
1942	10		1978	6+		
1943	4		1979	6+	1	
1944	6		1980	8+	1	1
1945	6		1981	9	3	
1946	7		1982	7		
1947	7	3	1983	12		
1948	14	1	1984	10	2	
1949	51	2	1985	11	1	
1950	31		1986	7		
1951	19(3)*	1	1987	14	1	
1952	9		*Totals*	576	26	2
1953	9(1)*					
1954	4(1)*					

* (Engineering Geology) included
+ B.Sc. degree in Mineral (Mining)

Table 3

Petroleum Engineering Graduates

Year	*BSc*	*MSc*	*MEng*	*PhD*
1950	13			
1951	24			
1952	22			
1953	17			
1954	13			
1955	14			
1956	21	1		
1957	8			
1958	15			
1959	22	1		
1960	13	5		
1961	17	1		
1962	7	4		
1963	6	5		
1964	2	2		
1965	1	4		
1966	-	4		

1967	-	3		
1968	-	5		
1969	-	1		
1970	-	4		
1971	-	1		
1972	-			3
1973	-	1		1
1974	-	2		
1975	-	5		
1976	3	2		
1977	5	3	1	
1978	7	1		
1979	4	3		1
1980	13	4		
1981	25	4		
1982	33	1	1	
1983	31	1	1	
1984	32	3		
1985	41	5		1
1986	39	3	1	1
1987	40	2	—	5
Totals	488	81	4	12

Note: During the period 1950 to 1973 all petroleum degrees were awarded by the Department of Chemical and Petroleum Engineering

Table 4
Graduates in Metallurgical Engineering

Year	*BSc*	*MSc*	*PhD*	*MEng*	*MEng Welding*
1958	2	1			
1959	6	5			
1960	2	3			
1961	5	3			
1962	7	1			
1963	6	3	1		
1964	6	7	3		
1965	10	2			
1966	9	2	2		
1967	7	1	2		
1968	3	2			
1969	2	1			
1970	8	1			
1971	11				
1972	9	3			
1973	11	2	1		
1974	12	1			
1975	11				
1976	6	2	1		

Year	*BSc*	*MSc*	*MEng*	*PhD*	
1977	10				
1978	3	1			
1979	5		1		
1980	2	1			
1981	8	2	2		
1982	6				
1983	9	1			2
1984	5	4			1
1985	4				1
1986	6	1		1	1
1987	9				1
Totals	210	46	11	3	6

Table 5

Mineral/Mineral Process Engineering Graduates

Year	*BSc*	*MSc*	*MEng*	*MEng (Oil Sands)*	*PhD*
1975	1		1		
1977	2				
1978	2				
1979	3				
1980	4				
1981	7	1			
1982	4			6	
1983	2			3	1
1984	3		1	1	
1985	2	2		2	
1986	4				
1987	3	2			
Totals	37	5	2	12	1

Table 6

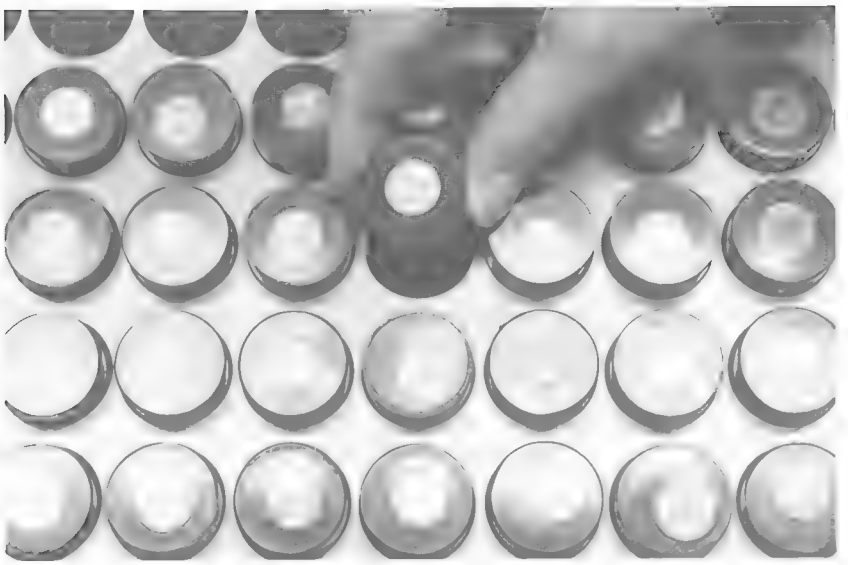
Mining, Metallurgical and Petroleum Engineering
Former and Present Academic Staff

Alan E. Cameron	1914-37
Norman C. Pitcher	1920-45
Ewald O. Lilge	1936-71
Karl A. Clark	1938-54
Thomas Patching	1947-80
John W. Gregg	1948-57
Peter M. Dranchuk	1952-present
James G. Parr	1955-64
Jan Leja	1957-65
Donald L. Flock	1957-67, 1969-present
William V. Youdelis	1958-65
Franz H. Vitovec	1965-82
Jurgen Fehling	1965-69

Loverne R. Plitt	1966-present
Alan E. Miller	1966-67
Samuel A. Bradford	1967-present
Ramon G. Bentsen	1968-present
Michael L. Wayman	1969-present
Michael Jeremic	1974-80
Thomas H. Etsell	1975-present
Brian Stimpson	1975-84
S.M. Farouq Ali	1978-present
Norbert Berkowitz	1979-present
Maurice Dusseault	1979-82
Barry M. Patchett	1979-present
Tadeusz Golosinski	1980-present
Brian C. Flintoff	1980-1988
Wayne H. Griffin	1982-present
Reginald L. Eadie	1976-78, 1983-present
Jerry M. Whiting	1983-present
Kenneth Barron	1984-present
Douglas G. Ivey	1986-present
W. Simon Tortike	1987-present

Department Heads/Chairmen

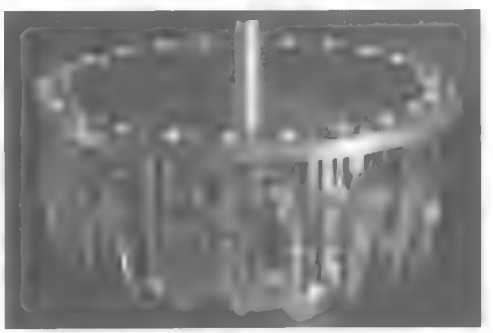
Norman C. Pitcher	1920-45
Karl A. Clark	1945-54
Ewald O. Lilge	1954-71
Franz H. Vitovec	1971-79
Donald L. Flock	1979-81
Loverne R. Plitt	1982-86
Jerry M. Whiting	1986-present



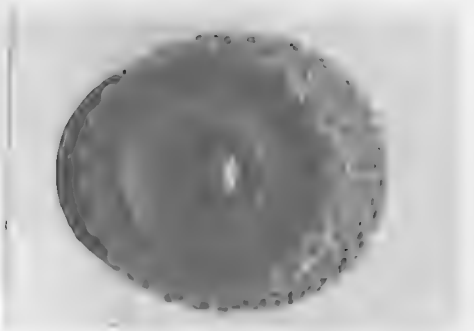
A selection of the countless metallographic samples prepared over the years in the metallurgical laboratories.

Testing of mechanical properties in the metallurgical laboratories.

Petroleum laboratory apparatus for water/oil separation.



Sample collector tray used in the petroleum laboratories. Here an oleic phase separates from an aqueous phase.



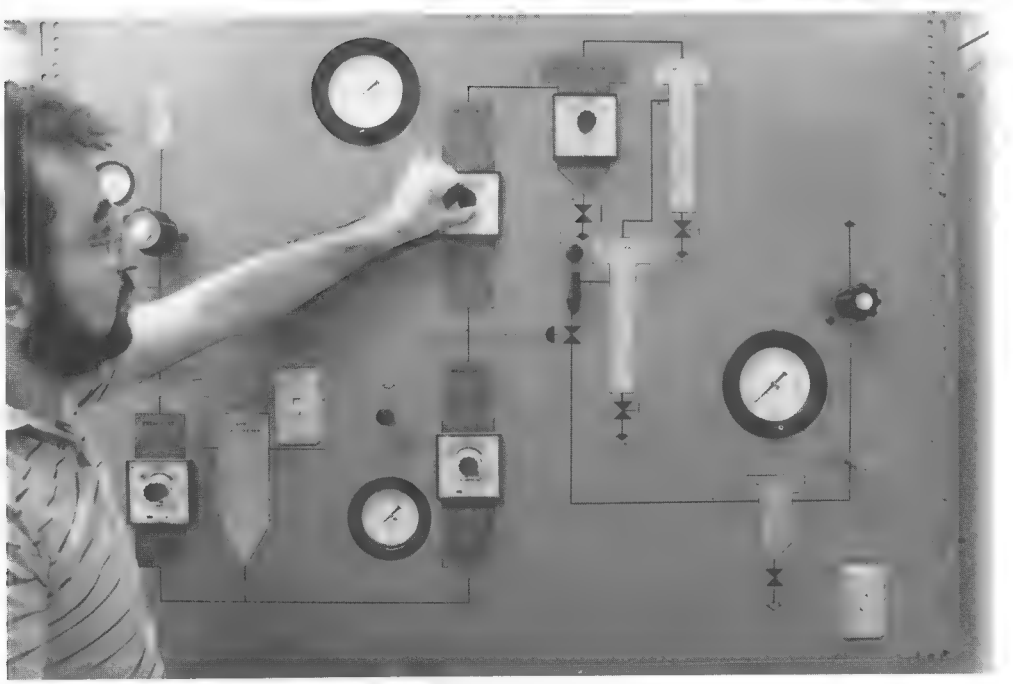
Scanning electron microscope, used for characterization of various materials ranging from metals to ores to oil sands.

Rotary, tungsten carbide tipped drill bit used for drilling major exploration holes in hard-rock mining.

Set of screens used for classifying crushed ore in the mineral processing laboratory.

Dragline in operation in an Alberta coal mine.

Laboratory model of a petroleum reservoir.



A part of the flash hydropyrolysis pilot plant, one of many techniques used to convert coal into synthetic crude oil.

Agricultural

Agricultural Engineering

By J.J. Leonard

Agricultural Engineering has been an integral part of the University of Alberta since the Faculty of Agriculture was established in 1915. The first course in farm machinery was included in the curriculum for the B.S.A. degree in 1916 and three courses in agricultural engineering were listed in the 1920-21 university calendar. These courses probably were not taught as the first appointment in agricultural engineering did not take place until 1921 when J. MacGregor Smith was appointed Professor and Head of the new Department of Agricultural Engineering. The Department of Agricultural Engineering was the fourth or fifth department established in the Faculty of Agriculture (appointments in both Agricultural Engineering and Entomology occurred in 1921) during the development years of the Faculty.

The Department of Agricultural Engineering, for the first thirty years of existence, was oriented toward teaching three courses (one each in machinery, buildings and power) to students studying toward the B.Sc. (Agr) degree and toward the delivery of farm extension programs on topics in Agricultural Engineering. Professor MacGregor Smith was the only appointment until 1946 so he was the individual responsible for all of the early work. Dean J.D. Newton described him as "a big hearty Scotsman with a knack of telling good stories". He was a popular public speaker and well known judge at plowing matches. As well, he published many practical farm bulletins relating to farm machinery, some of which had up to seven printings and many of which were distributed around the world. Professor MacGregor Smith was keenly interested in promoting public speaking within the Faculty of Agriculture and donated the J. MacGregor Smith public speaking trophy for an annual competition within the Faculty, an event that remains part of the Faculty today.

Growth in the size of the Department began in 1946 with the appointment of a second staff member, Barney T. Stephanson. He supported the extension activities of the Department by conducting on-farm demonstrations of the safe use of tractors which were rapidly replacing horses as a source of power on the farm. Fenton V. MacHardy was appointed in 1950 to replace Professor MacGregor Smith who died April 18, 1950. The Department became a one-man department again when Professor MacHardy resigned from full-time staff in 1952 to return to farming in Vermilion. However, he continued to teach on a sessional basis until 1958 when he was appointed Head of the Department and was given a full time appointment.

Significant expansion of the Department began in 1958 when the demand for university education began to increase in the late 1950's and early 1960's. The student population at the University began to increase rapidly and this increased

the financial resources available to the University because government funding to the University was based on the size of the student population. As well, the philosophy of education changed from one where the opportunity to attend university depended on parental support to one where the government agreed to increase the public support of secondary education so that every individual with the ability and desire to attend university could do so. The Department expansion began with the offering of a specialization within the B.Sc. (Agr.) degree called Industrial Agriculture in 1959-60. The program emphasized training in production management, agricultural processing, agricultural mechanization and business administration. Course offerings in the Department increased from four to seven in 1959-60 and then at a rate of one or two per year as additional staff was hired, until 21 courses were offered in 1980-81.

Four additional academic staff were hired between 1963 and 1970. A graduate program was initiated in 1963 and the first M.Sc. graduates convocated in May 1966. Additional resources for research were acquired in the form of a research farm near Ellerslie. Computer technology was just developing and the staff in the Department were quick to use the new tool in their research. By 1970, the Department consisted of six academic staff, one farm manager, two secretaries, four technicians and a draftsman. The expertise of the academic staff covered the main areas of agricultural engineering of power and machinery, structures and environment, and soil and water, with the addition of specific interests in operations research and agricultural systems.

The period from 1970 to 1980 was a period of development in two areas. In 1970-71, the Department developed an undergraduate curriculum which enabled the graduates to register as engineers-in-training in the province of Alberta. The program was changed in 1979-80 to a cooperative program with the Faculty of Engineering where the Faculty of Engineering and the Faculty of Agriculture and Forestry jointly offered the B.Sc. (Agricultural Engineering) degree. The second area of development in the Department occurred in the area of a program in forest operations and wood science. The Faculty of Agriculture became the Faculty of Agriculture and Forestry in 1971 when the Forest Science Department was added. Other departments in the Faculty added staff and undergraduate courses to support undergraduate training in forestry and the Department of Agricultural Engineering was selected to provide training in forest engineering and in wood science. Two additional academic staff were added to teach and conduct research in these subject areas. The Department, at the beginning of 1980, included 8.17 full-time equivalents in academic staff appointments, three research associates, a farm manager, four technicians and three secretaries. This complement of staff represented the peak staffing level of the Department.

The period from 1980 to the present has been a period of consolidation. The Department finally moved into permanent research and teaching space in the new Agriculture-Forestry Centre in 1981 and into permanent office space in the General Services Building in 1983. Since then, financial constraints have caused some reductions in the number of academic and support staff in the Department. Within the academic staff since 1980, two people retired, one person died and one person has been promoted to the staff of the Vice-President (Administration). New academic staff members to the level of two and one-third full-time equivalents have been appointed to fill these vacancies which represents a loss of one and two-thirds full-time equivalents in the academic staff complement. In addition, one technician

position has been lost in the support staff and reduced research funds have reduced the number of research associates appointed.

The Department offered three courses in agricultural engineering for the first thirty years of its existence. The first change took place in 1951-52 when a course entitled, "Introduction to Agricultural Engineering" was offered. The course remained in the calendar until 1957-58 when it was discontinued and replaced by a course that emphasized layout analysis, operations research and time and motion study.

Much of the stimulus for curriculum development after 1958 came from the increased numbers of students attending University. Prior to this time, student enrolments increased at a moderate rate with the exception of a bulge in enrolments that occurred after 1946 when the men and women leaving the Armed Forces returned to university. Enrolments increased from approximately 650 in 1920 to approximately 2,300 in 1939. Almost twenty years elapsed before student enrolments doubled from the pre-war levels as the enrolment in September 1958 was a record 5,241 students. However, by 1964, enrolments had increased to 9,915 students and by 1968 to 15,290. These increases occurred despite the fact that a second campus (and later University) was established in Calgary in 1958. This increase in enrolments allowed the University to expand the programs of study offered to students and the staff in Agricultural Engineering were quick to take advantage of the opportunity.

Specialization in Agricultural Engineering within B.Sc. (Agr)

A major milestone was reached in the history of the Department with the publishing of the 1958-59 University Calendar. This calendar carried the outline of a program of specialization in the Department under the name of Industrial Agriculture. Three additional courses in the Department were offered as part of the program and the content of these courses gave students training in operations research methods and in methods for analyzing agricultural production systems. These courses along with the courses in agricultural engineering fundamentals were designed to give students the skills necessary for careers in production management, agricultural servicing and processing industries and in business administration. Courses were added at the rate of one or two per year as staff were hired which allowed the Department to broaden the subject areas taught to the point that the program included courses in all the different specializations within Agricultural Engineering. In 1962-63, the program was renamed Agricultural Mechanization and in 1978-79 it was given the current name of Engineering Agrology.

Special Program in Agricultural Engineering

The increased enrolments in University reflected an increase in the employment opportunities available to graduates. For the students in Agricultural Mechanization, some of the employment opportunities were not available because the employer required that the individual hired be registered as a professional engineer. A special program of studies was developed in 1971-72 in cooperation with the Faculty of Engineering where students in the Agricultural Mechanization program could take a selection of courses in the Faculty of Engineering which would allow the graduates to register as engineers-in-training in the Province of Alberta. These courses were in addition to the courses required to satisfy the requirements of the B.Sc. (Agr) degree so students had to take very heavy course loads each year if they

wanted to complete the degree in four years. In 1979-80, this program was replaced by a program of studies that leads to the B.Sc. (Agricultural Engineering) degree. The degree is administered by the Joint Agricultural Engineering Curriculum Committee which has equal representation from the Faculty of Agriculture and Forestry and from the Faculty of Engineering. Changes in the program must be approved by both faculties. The first graduates from the program received their degrees in May 1980 and the program was accredited by the Canadian Council of Professional Engineers for the first time in 1981.

B.Sc.(Forestry) - Courses in Forest Operations and Wood Science

Soon after the B.Sc. (Forestry) degree was approved, the Department of Agricultural Engineering was asked to develop a selection of courses that would give students training in two options within the program of studies leading to the B.Sc. (Forestry) degree. The options were in forest operations and in wood science. A course in wood science was added in 1973-74 and taught by the existing staff within the Department of Agricultural Engineering because the Department was having difficulty attracting academic staff with training in forest engineering. The first staff member in forest engineering was appointed in 1976 and several courses were added to the program shortly after his appointment. A second staff member was appointed with training in wood science in 1977 so both subject areas were supported by academic staff. Substantial revisions in the course offerings have occurred since then.

A number of staff are no longer with the Department but they are part of the history of the Department. As such, they have left the Department a legacy in the type of personality they were and in their area of interest.

Appointed and Since Retired:

John MacGregor Smith (1921-1950)

The first 30-year history of the Department of Agricultural Engineering is principally the story of John MacGregor Smith, who began his duties here on January 1, 1921 and continued until the time of his death on April 18, 1950. MacGregor Smith was born in Scotland and received a degree in Agriculture from the University of Edinburgh. He moved to Clearwater, Manitoba in 1905 and worked for a time on a farm. In 1910, he entered the third year of a five-year program of studies at the Manitoba Agricultural College and graduated in 1913. He was active in student affairs as he became president of the student body and won at least one public speaking contest.

Upon graduation, MacGregor Smith went to work at the University of Saskatchewan for A.R. Greig in the Department of Agricultural Engineering. He began his career in agricultural extension in Saskatchewan as a member of the staff that travelled with the "Better Farming" trains. These trains would stop at communities throughout the province and present programs on better farming methods that could be used by the new farmers who had recently settled the rural areas of Saskatchewan.

Professor MacGregor Smith spent the summers of 1924, 1925 and 1926 at Iowa State College studying under J.B. Davidson who is commonly known as the father of agricultural engineering in North America. In 1938, he travelled for five months through England and Scotland to study farm equipment developments there.

Agricultural extension was MacGregor Smith's principal interest and he was

well suited for the task because he was an accomplished speaker. As well, he was asked to judge a multitude of plowing matches. His written works were primarily in the form of practical farm bulletins which were widely distributed.

At the University, he was very active in assisting the Agricultural Club and, to show their high regard for him, this Club presented MacGregor Smith with an honorary life-time membership scroll in 1949. He was a charter member of the Agricultural Institute of Canada. MacGregor Smith was also a member and fellow of the American Society of Agricultural Engineers and he took a prominent role in the establishment of the Alberta Institute of Agrologists during the formative years of the Institute.

Barney Thorvardur Stephanson

Barney Stephanson, appointed in 1946, completed his Bachelor of Engineering degree in 1944 at the University of Saskatchewan and his Master of Science degree in 1960 at the University of Minnesota. He was Acting Head of the Department of Agricultural Engineering from 1950 to 1958 and was appointed Chairman of the Department from 1974 to 1981. Most of his early work in the Department was oriented toward agricultural extension activities and teaching undergraduate courses, as that was the emphasis in the Department under MacGregor Smith. While he was Acting Head, he continued this emphasis until funds were obtained to hire a second full-time academic staff member.

During the latter part of his career at the University of Alberta, Stephanson became very involved in the international development of university training in agricultural engineering. In 1966, he was seconded to the Canadian International Development Agency(CIDA) to work at the University of West Indies for a year advising them on the academic content of their agricultural engineering training. A second assignment with CIDA began in 1968 and lasted until 1973 at the University of Science and Technology at Kumasi, Ghana. For the initial part of the assignment, he was Head of the Department of Agricultural Engineering at Kumasi during which time he established the academic program and staffed the Department. Later, he served as Dean of the Faculty of Agriculture while qualified nationals were trained and developed to continue with the university program. Upon returning to the University of Alberta, he became Chairman of the Department of Agricultural Engineering for seven years prior to taking a final international assignment at the University of West Indies, where he assisted with the development of an undergraduate agricultural engineering program at the University.

Stephanson was a charter member of the Canadian Society of Agricultural Engineering and one who was instrumental in the choice of the name. He was always concerned about making the professionals in the two disciplines involved in agricultural engineering feel "at home", so he argued effectively for the name to use the word "engineering" rather than "engineers", as was the practice with the American Society of Agricultural Engineers. As well, he was a strong supporter of CSAE activities and, in recognition of his work, the CSAE honored him with the grade of "Fellow" in 1978.

Fenton Vincent MacHardy

Fenton MacHardy, appointed in 1950, completed his Bachelor of Engineering degree in 1950 at the University of Saskatchewan, his Master of Science (Mechanical Engineering) degree in 1958 at Northwestern University and his Ph.D.(Agricultural

Economics) at the University of Edinburgh in 1964. He was appointed Professor and Head of the Department in 1958 and in 1968 became Dean of the Faculty of Agriculture. In 1975, he was appointed University Professor until he retired in 1984.

MacHardy was one of the "bulge" of Armed Forces personnel who returned to University after World War II ended. He spent his time in the Royal Canadian Air Force and developed considerable skills in electronics. His return to the farm developed his interests in finding ways of applying industrial engineering techniques to studying agricultural production methods. He was continually looking for the analytical procedure that would define the "one best way" of producing agricultural crops and livestock. Prior to his appointment as Dean of the Faculty, his research was oriented towards identifying the factors that affected the selection of machinery and buildings for farming operations. The experience in the Armed Forces with electronics stimulated his interest in the use of analog and digital computers as tools to speed the analytical methods,and he was one of the first individuals to make extensive use of the university digital computing facilities that developed from 1959 to 1967. His Scottish ancestry strongly affected his administration of the Department, so dollars were spent sparingly in order to maximize the amount of work that could be done on the funds available.

MacHardy's interest in industrial engineering as it applied to agriculture developed his reputation as a "systems" specialist. He was in considerable demand by international agencies to work on problems that required an inter-disciplinary approach to problems in food production. This continued while he was Dean of the Faculty and stimulated his interest during his "second" research career (during his appointment as University Professor) into methods for reducing non-renewable energy inputs to agricultural production. His research during this period included projects that examined both biological and chemical methods for fixing nitrogen in the soil as a mechanism to reduce the amount of chemical fertilizer required to produce crops.

MacHardy's contribution to agriculture and to agricultural engineering sciences was recognized by his peers. In 1978, he was made a Fellow of the Agricultural Institute of Canada and in 1981 a Fellow of the Canadian Society of Agricultural Engineering.

Thomas Alexander Preston

Tom Preston was appointed in 1963 and brought with him extensive experience in the application of work measurement methods to agricultural production. His academic training included a Bachelor of Arts from Cambridge (1950) and a Master of Arts from Cambridge (1956). He gained his experience in work study with his work in agricultural industry and later with a consulting firm prior to coming to the Department of Agricultural Engineering. His research in the Department involved the examination of farm operations that required human labor in order to determine measurements of efficiency. As well, he was able to maintain an active consulting interest and was a popular lecturer in evening extension classes. In 1972, he was seconded to CIDA for a two year assignment in Nigeria at the University of Nsukka where he worked with the agricultural extension personnel. While in Africa, he contracted the tropical disease called "river blindness" and this was one factor that led to his decision to take early retirement in 1980.

Elliot Gray Alcorn Grimmer

Al Grimmer was the first appointment to support the new program in Forestry. He obtained his Bachelor of Science (Forest Engineering) from the University of New Brunswick in 1948. He spent the next twenty seven years primarily with Abitibi Paper Company in all phases of wood operations. His experience with the skill requirements of operating personnel in the forest helped define the structure of the undergraduate training in the forest operations option for the B.Sc. (Forestry) program. As well, he developed a course in surveying and photogrammetry which is now one of the core courses in the B.Sc. (Forestry) program. Poor health prompted his early retirement in July, 1985 which was followed by his death in late 1985.

Enrolment Statistics

Enrolment statistics for B.Sc. (Ag. Eng.) Program 82-83 to 87-88

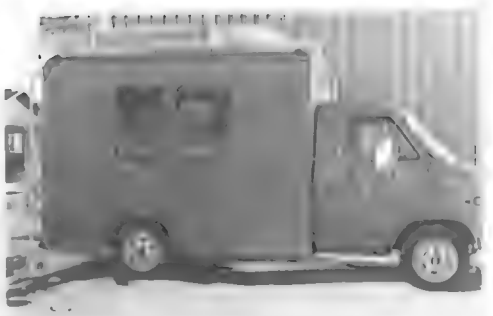
	82-83	**83-84**	**84-85**	**85-86**	**86-87**	**87-88**
First Year	17 (23)	27 (29)	20 (17)	14 (11)	9 (12)	13
Second Year	17 (17)	17 (17)	22 (24)	17 (12)	8 (7)	15
Third Year	9 (9)	13 (13)	16 (15)	20 (22)	12 (12)	7
Fourth Year	5 (5)	8 (8)	13 (14)	16 (16)	19 (21)	16
Totals	58 (54)	65 (67)	71 (70)	67 (61)	49 (52)	51
Degrees Granted	6	6	8	15	18	

Figures in brackets are enrolment figures for January 1983, 1984, 1985, 1986 and 1987

Mobile data acquisition van for field research.

Tractor coupled to a power-take-off dynamometer - Ellerslie Research Station.

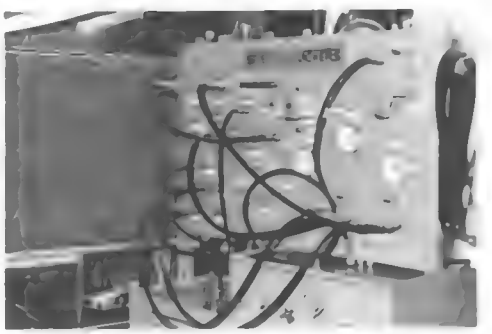
The original farm machinery laboratory in the North Lab.



Graduate Student space in the Agriculture and Forestry Centre.

Setting up equipment for research into axial-flow combine performance - Ellerslie Research Station.

Agricultureal Engineering Facilities at the Ellerslie Research Station.



Prof. B. Stephanson demonstrating some early alternative energy "research"!

Hands-on Laboratory Instruction includes use of (a) Air Movement and (b) Hydraulics apparatus in the MacGregor Smith Laboratory.

Computing, electronics and instrumentation are important aspects of Agricultural Engineering.

Cooperative Education Program

Cooperative Education Program in Engineering

By K.C. Porteous

Cooperative or Co-op education formally integrates academic studies with paid study-related work experience in employer organizations. It represents a cooperative arrangement among three parties - the University, students and employers.

The Co-op concept originated in 1907 at the University of Cincinnati and has gained world wide acceptance. Co-op came to Canada in 1957 when the University of Waterloo implemented a cooperative program in engineering.

At this University, the efforts to implement an optional Co-op engineering program began in the late 1970's. The interest in such a program was based on three considerations. First, some of our students felt that Co-op graduates from other schools had an advantage in obtaining permanent positions with Alberta based companies. Second, a substantial number of the larger companies operating in Alberta were hiring out-of-province Co-op engineering students for work terms on a year round basis. These companies and other organizations indicated a strong support for Co-op and a willingness to hire our Co-op students if a program were established. Finally, some forecasts predicted a shortage in the future supply of engineering manpower within Alberta. Although the magnitude of the predicted shortfall was dependent on the assumed number of mega projects, some shortage was to be expected in all cases. Based on these forecasts, the training of additional engineers appeared to be essential.

In 1979, Dr. P.F. Adams, Dean of Engineering, requested that a formal proposal be developed for a Co-op program in engineering. The task was coordinated by Dr. D.G. Bellow, Chairman of Mechanical Engineering with input from Dr. J.S. Kennedy, Associate Dean (Student Records), the chairmen of Chemical, Civil, Electrical and Mineral Engineering, and Mrs. P. Kushnir who ran the summer work experience program (SWEP). This initiative which had operated since 1979 assisted students in finding discipline related employment for the summer.

The final proposal combined the implementation of a five year Co-op degree program with a twenty per cent increase in undergraduate enrolment. Sequences of academic and work terms were defined for each discipline with a five year phase-in period. Co-op was to be implemented in Mechanical Engineering in year one, Electrical and Mineral Engineering in year three and Chemical and Civil Engineering in year five. The funding included additional facilities and support staff, twenty-one new full-time faculty positions and the establishment and staffing of a Co-op office. This office was responsible for counseling Co-op students on job search techniques, marketing the Co-op program to employers to obtain their support and participation, and visiting students at the work site to assess their

performance. The University Board of Governors approved the proposal in April 1980 provided funding was forthcoming from the Alberta Government. This funding approval was obtained in February 1981.

In early 1981, the priorities were to staff the Co-op office, or Engineering Placement Office as it was to be known, develop program policies, define regulations and systems including the placement process, and to enlist the first group of students.

Much of the original infrastructure remains in place. Academic/work term sequences as they currently exist are shown in Figure 1. Stream "B" was dropped from Mechanical Engineering in 1986 and Stream "C" was introduced for Metallurgical Engineering in 1987. The management structure of the Co-op office was changed in 1984 with the creation of the position Associate Dean Cooperative Education. The name of the office was also changed to the Centre for Cooperative Education.

The first Co-op class consisting of twenty-seven mechanical engineers was placed in engineering related positions for the summer of 1981. Student and employer enthusiasm was such that a decision was made to implement Co-op in Civil and Mineral Engineering in 1982 and Chemical and Electrical Engineering in 1983 i.e. one year earlier than planned. In 1987, the program was expanded to include Agricultural and Computer Engineering.

Figure 2 summarizes the Co-op enrolments, graduation and employment statistics since 1981. The growth has been dramatic and student demand exceeds the available places in second year. These are managed in relation to the expected placement prospects and are set at twenty-five to fifty per cent of the second year quotas in each discipline. Currently, twenty-eight per cent of the students in second year and beyond are in Co-op.

Co-op student employment rates for every work term have exceeded ninety per cent and have frequently reached one hundred per cent. This reflects the strong commitment which employers have made to the program. In 1987, 146 employers hired our Co-op students. The employer base includes all major engineering employers within the Alberta private and public sectors plus numerous smaller organizations. Approximately ten per cent of the students accept positions outside Alberta. These out-of-province employment opportunities are increasing as more out-of-province employers become aware of our program.

Since early 1985 management of the Co-op program has been the responsibility of K.C. Porteous, Associate Dean Cooperative Education. Five professional staff: K. Barker (Macmillan), R. Kully, B. MacKenzie, C. Ottosen, and B. Strang, handle the coordination and placement activities. A number of people who are no longer involved with the program made significant contributions in formulating policy and establishing our initial base of employers. These include P. Kushnir, F. Trehearne, L. Kent, and R. Goldbeck.

The Co-op office, which includes offices, a reference library and interview facilities, is located on the 5th floor of the Students' Union Building.

Figure 1

Co-op Academic/Work Term Sequences

	1st Year			2nd Year			3rd Year			4th Year			5th Year		
	F	W	S	F	W	S	F	W	S	F	W	S	F	W	S
Stream "A" Agricultural* Civil Mechanical Mineral*	Study 1	Study 2	V	Study 3	Study 4	Work Exp 901	Work Exp 902	Study 5	Work Exp 903	Study 6	Work Exp 904	Work Exp 905	Study 7	Study 8	
Stream "B" Computer Chemical Electrical	Study 1	Study 2	V	Study 3	Study 4	Work Exp 901	Study 5	Work Exp 902	Work Exp 903	Study 6	Study 7	Work Exp 904	Work Exp 905	Study 8	
Stream "C" Metallurgical	Study 1	Study 2	V	Study 3	Study 4	Work Exp 901	Study 5	Study 6	Work Exp 902	Study 7	Work Exp 903	Work Exp 905	Work Exp 905	Study 8	

F - Fall Term (September-December)
W - Winter Term (January-April)
S - Summer Term (May-August)
V - Summer Vacation

*offered jointly with the Faculty of Agriculture and Forestry
*Includes Mining, Mineral Processing, Petroleum

Figure 2

Co-op Program Enrolment Graduation and Employment Statistics

Year	*Co-op Student Enrolment*	*Annual Average Employment Rate % (1)*	*Co-op Graduates*
1981	78	100	-
1982	203	98	-
1983	286	92	-
1984	343	97	22
1985	464	97	41
1986	476	94	72
1987	496	97	81

[1] Percentage of those students scheduled to work who obtained employment.

Appendix I
The Growth and Financial Support of the Faculty

The undergraduate registration, the number of academic staff, the operating budget which largely reflects the staff salaries, and the capital budget are shown in Table 1. There was a sharp rise in enrolment following World War I and steady growth for the next 20 years; from 70 in 1920 to 300 in 1940. During this period, the size of the staff and the operating budget remained fairly constant. During the period 1945-50, enrolment surged with the return of the men who had served in World War II. Registration peaked in 1948 at nearly 1,000. The academic staff increased but not in proportion to the increase in student numbers; the slack was taken up by many hard working graduate student-assistants. During the two decades from 1950 to 1970 the operating budget, which largely reflects staff salaries, increased at a rate of about $1,500 per year per staff member. The sharpest increase in the operating budget took place in the five year period 1975 to 1980 when the operating budget increased at a rate of $5,600 per-year per-staff member. The rate of increase reflects the high inflation and the booming economy of the province during that period. Capital equipment grants are buried somewhere in the financial statements of the University and are impossible to sort out. The first separate mention is made of them in 1959 when the capital equipment grant of the entire university was $495,000. Within three years the capital budget had soared to over $2,000,000 from which engineering was allocated $460,000. During the 25 year period of 1960 to 1985, the capital equipment grant for the Faculty of Engineering bounced up and down like a yo-yo, from a low of $126,000 in 1973 to $1,100,000 in 1983 with an average of $503,000 per year. Such figures are interesting, but do not always reflect their true value. Inflation and other factors must be taken into account.

But now the University is feeling the consequences of the downturn in the economy as the Government finds it can no longer maintain an ever increasing level of support. The tight, "hold the line" fiscal policy now in effect combined with inflationary costs has either eliminated or severely curtailed many of the functions expected of a university. Accumulated deficits in the operating and capital budgets approach 10 million dollars. Classes are too large, outdated equipment cannot be replaced, essential renovations are being postponed. Academic and support staff positions are being eliminated. We face a general lowering of the quality of education offered at the University of Alberta. The capital building program is suffering from the lack of funds as well. Phase Three of the Engineering Complex, a new building for the Department of Electrical Engineering together with facilities for Computing Science, has long been planned. Each time it reaches the detailing stage

the lack of building funds dictates another postponement of indefinite length. Shades of the 1930's! I hope the Faculty of Engineering will not be forced to wait two decades, once again, before their space needs are met. It is no longer possible for the Government to provide the support required by a university. The Faculty of Engineering, if it is to maintain the level of excellence reached over the past seventy-five years, must turn to our colleagues in the business world for support. Increasing support from the corporate community is an investment not a contribution. Such funds provide the essential extras that make the difference between mere acceptability and excellence.

Table I

Year	*Undergraduate Registration*	*Graduate Registration*	*Number of Regular Staff*	*Operating Budget*	*Capital Equipment Budget*
1910	21	0	1	n/a	n/a
1915	83	0	7	9,000	n/a
1920	67	1	9	17,350	5,525
1925	126	0	10	32,220	n/a
1930	268	1	11	37,255	n/a
1935	263	8	11	41,530	n/a
1940	300	0	16	47,678	n/a
1945	346	14	18	76,703	n/a
1950	775	21	28	198,073	n/a
1955	838	15	26	236,806	n/a
1960	1,159	54	51	637,980	183,720
1965	1,028	141	57	1,238,240	299,514
1970	1,414	247	76	2,651,185	400,000
1975	1,513	193	93	3,955,597	325,000
1980	1,942	238	107	7,540,485	620,000
1985	2,230	388	154	11,808,314	899,000

Appendix II

As part of the 75th Anniversary celebrations of the Faculty of Engineering honourary degrees will be awarded to George Ford, Professor Emeritus of Mechanical Engineering; Egerton (Edge) King, former CEO of Canadian Utilities Ltd.; and to Donald Stanley, CEO of Stanley Associates Engineering Ltd.

E.W. King

Edge King

Edge King was born in Calgary, May 19, 1919, and was educated in Okotoks, Alberta, and Fernie, B.C. He entered the University of Alberta in the fall of 1938. In the first laboratory session of Physics 21 Edge King and George Ford, two very nervous freshman, were lab partners. Now 50 years later, we return to the same building to be honoured by the Faculty. Edge graduated in 1943 with a B.Sc. in Electrical Engineering. He served as an Electrical Lieutenant with the Royal Canadian Navy with overseas service on landing craft and at Naval Service Headquarters in Ottawa from 1943 to 1945.

Following the war, he joined the East Kootenay Power Company Limited at Fernie B.C. and served there for 10 years. Edge returned to Edmonton in 1955 to manage the McGregor Telephone and Power Construction Company. In 1956, he joined Canadian Utilities Limited as Superintendent of Transmission and Distribution. From 1981 until his retirement in 1984, he was Chief Executive Officer of Canadian Utilities Limited and its subsidiaries.

Following his retirement, Edge was appointed Chairman of the University of Alberta Hospitals Board where he led the Hospitals through the transition from the former University of Alberta Hospital to the new Walter C. Mackenzie Health Science Centre. He was reappointed for a second term in 1987.

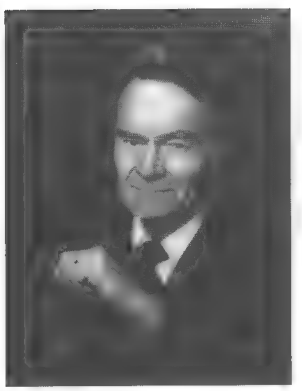
Edge has served on the Conference Board of Canada, and as a director of seven utilities companies; currently he holds directorships in ATCO Ltd., C-I-L Inc., Douglasdale Estates Ltd., Ducks Unlimited Canada, Echo Bay Mines Ltd., Pacific Western Airlines Corp., Rolls Royce Industries Canada Inc., and Royal Trustco.

Edge is a Life Member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta, and a member of the Associations of Professional Engineers of B.C. and the Yukon. He is a member of the University of Alberta Business Advisory Council, and the Edmonton Advisory Board of Royal Trust, past President of the Alberta-Northwest Chamber (Mines-Oils-Resources), the Edmonton Chamber of Commerce, the Northwest Electric Light and Power Association, the Canadian Electrical Association and the Canadian Gas Association. He is a past

director of the United Community Fund for Edmonton and sits as a member of the Canadian Special Olympics and the Edmonton Exhibition Board.

An avid sportsman, he loves being up to his waist in a fast-moving stream, fly casting for trout or arctic grayling. When time permits he enjoys a round of golf at either the Derrick or Mayfair clubs.

Edge married Mary Phillips in November, 1943. They have five children; Donald, Peter, Helen, Michael and David.



D.R. Stanley

Donald R. Stanley

Dr. Donald R. Stanley, a native of Edmonton, graduated with distinction in Civil Engineering from the University of Alberta in 1940.

After three years of military service, from 1942 to 1945, as an Engineering Officer in the Royal Canadian Air Force, Don Stanley became Director of Environmental Engineering for the Government of Alberta for a period of four years; during this period he obtained his Master's Degree in Environmental Engineering from Harvard University on a Rockefeller Foundation Fellowship. A Government of Canada Fellowship enabled him to spend two additional years in studies and research for his PhD in Environmental Engineering. During the next two years he was a principal in a western Canadian consulting firm engaged in the design and supervision of construction of municipal installations. In 1954, he founded the firm which has developed and grown into the firm of Stanley Associates Engineering Ltd. It is one of the largest consulting engineering firms in Alberta and provides engineering services on an international basis. Stanley has acted as a consultant in a number of international environmental engineering problems in Malaysia, Philippines, Tanzania, Korea and the Caribbean.

A past President of the University of Alberta Alumni Association and a former member of the University's Board of Governors, Don Stanley has been active in numerous organizations. He is a past President of both the Edmonton and Alberta Chambers of Commerce; Board member of the Canadian Chamber of Commerce, Executive Committee Board member of the Alberta Research Council; member of the Expert Advisory Committee on Environmental Health for the World Health Organization; and Board member of the Edmonton Economic Development Authority.

During his many years of practice, Dr. Stanley has received honors and awards for his distinguished service to Canadian business and engineering: among them are the Julian C. Smith Medal from the Engineering Institute of Canada for achievement in the development of Canada; the first recipient of the Carson F. Morrison Award from the Association of Consulting Engineers of Canada for accomplishment in technical design, leadership in business, ethics and service to the engineering profession; the Frank Spraggins Award for integrity, expertise, and outstanding accomplishments in the field of engineering; and the L.C. Charlesworth Award; both from the Association of Professional Engineers, Geologists and Geophysicists of Alberta.

Donald R. Stanley is married to Joan Sally Bibby. They have three children, Mary Louise; Russel Bruce, who like his father graduated with distinction in Civil Engineering; and Donald Westgarth.

Appendix III

The Alberta Summer Institute for Petroleum Industry Development (ASIPID)

In 1982 the United Nations Development Program (UNDP) requested the Faculty of Engineering to provide a short-term training program for a group of Indonesian petroleum personnel. The program was very successful. The Indonesian participants urged the Faculty to make it an annual affair and to include individuals from other developing countries who needed to increase their expertise in the petroleum sector.

Since then, people from 40 countries have participated in a two-month program on petroleum. The participants attend lectures, visit large and small petroleum businesses, go on field trips and visit other educational institutions and provincial government departments. Although activities centre around the two cities of Edmonton and Calgary, participants are afforded the chance to see other parts of the province. There are a variety of socio-cultural activities to complement the technical program.

The Institute incorporates Canadian expertise, including university educators, specialists in management, training and man-power development as well as practicing professionals from the petroleum industry and related government ministries.

The program is designed for personnel from countries currently developing or upgrading their petroleum industries. Courses are aimed at professionals in middle and senior-level management in government and industry, graduate engineers and scientists with two or three years experience related to the industry.

It is a practical training program which includes visits to oilfields, refineries and other related industrial sites. The group also takes part in a three day geological field trip through Banff and Jasper National Parks. Participants attend the initial one week orientation to Alberta and receive a global overview of the petroleum industry. They choose one of the three options (management, upstream or downstream), each of which lasts six weeks.

An optional four week English Language course, designed to improve competency in conversational English, is provided prior to the commencement of the program for those participants who wish to improve their English language skills.

The introductory week begins with an orientation to the ASIPID program, the University and Edmonton. Lectures on the history, economics and culture of Canada are included. The petroleum overview topics include current trends in global energy technology and economics. The first week allows the participants to meet one another and to settle into the program.

The upstream program consists of activities that take place before the natural resource reaches the processing facility. Topics include onshore and directional

drilling techniques, hydrocarbon geology, stratigraphy, exploration techniques, offshore drilling and well completion, reservoir engineering, well logging and the primary depletion of oil and gas reservoirs. This option is directed to geologists, engineers, senior technologists, production managers, and managers who need to develop background in the area so that they can perform their duties more efficiently.

The downstream option consists of activities which occur after the natural resource leaves the well head. Topics include gas processing, refining, petrochemicals, pipelining, tanker transportation and marketing. The option is technically stimulating for the industrial professional as well as providing a broad technical perspective for management personnel.

The management program focuses on such topics as human resources, organizational diagnosis and motivations, project management and information systems. The participants spend time with the provincial Department of Energy and with the Energy Resources Conservation Board which regulate the petroleum industry in Alberta.

The final week of the program brings the three options together. Discussions focus on new ideas and the means of transferring technology to other countries. At the final banquet, certificates of attendance are presented.

Twenty-four participants from 11 countries attended the first program in 1983. Since then 178 participants from 40 countries have benefited from the ASIPID program.

Appendix IV
Land Grant Institutions in the U.S.A.

There are 69 land-grant institutions in the U.S.A. Institutions such as: Idaho, Oklahoma A & M, Cornell, M.I.T., and Texas A & M were called land-grant colleges because public lands were granted by the states for their establishment and support. The purpose was to provide a college in each state "where the leading object shall be, without excluding other scientific and classical studies and including military tactics, to teach such branches of learning as are related to agriculture and the mechanical arts, in such manner as the legislature of the states may respectively prescribe in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life".

Appendix V
The Athlone Fellowship

In 1950 Sir Arthur Fleming and Dr. William Abbott visited eleven Canadian universities to discuss the possibility of a fellowship plan whereby Canadian graduate engineers would receive further training in the United Kingdom. Their recommendations were accepted and the resulting plan was announced in the House of Commons of the United Kingdom by the President of the British Board of Trade on November 16, 1950. The Earl of Athlone, who was Governor-General of Canada from 1940 to 1946, consented to have the fellowships named after him. The rationale for the fellowship program was to expose highly qualified Canadian engineering graduates to British technology and engineering practice with the view to trade enhancement.

The Earl of Athlone

The introduction in a 1968 brochure "The Athlone Fellowships" makes the following statement:

> The rapid expansion of Canada's industry is calling for large numbers of men with high scientific, technical and managerial ability. To such men the United Kingdom's industrial plants, research organizations, colleges and universities have a great deal to offer. Only, however, if they are seen at first hand is it possible to appreciate fully the scope and quality of engineering research, development design and production practices in Britain. Since 1951 the British Government has, therefore, been providing Athlone Fellowships for young Canadian engineers. The Fellowships are granted on the understanding that their holders will undertake a course of study or training in the United Kingdom and will afterwards return to Canada to follow their careers in engineering. The number available each year is now about 41. The awards enable the successful candidates to pursue their further education and experience in engineering and, at the same time, to meet the British people and become acquainted with their way of life. This is aimed to foster the understanding between the two countries and so help to encourage trade in both directions.

Initially, the fellowships were to be in two groups; 28 for engineering graduates straight from participating Canadian universities, and a further ten to be available to engineers who were already in industry. By 1968, the 28 places had increased to 41 and the number of participating Canadian universities had increased from 11 to 22.

The fellowships covered the costs of transportation, fees and maintenance for a period of up to two years. The recipient could choose works training in one or more approved industrial organizations; post graduate studies in a United Kingdom university, college, research establishment or some combination thereof.

The first graduates arrived in Britain in the autumn of 1951. At the conclusion of the program in 1970 over 50 Canadian engineering graduates a year were being supported. During the 20 year life of the scheme 55 students from the Faculty of Engineering at the University of Alberta were selected as Athlone fellows; of those six now teach in the Faculty.

During the period the program was in effect, 810 Canadian graduates took advantage of the scheme: 56 spent two years in industry, 428 spent two years in a university, college, or research establishment, 245 took a mixed program, and 81 spent only one year either in university or industry.

The University of Alberta Fellows by year of selection, branch of engineering and course of study in the United Kingdom are:

Name	*Branch of Engineering*	*Courses of Study in U.K.*
1951 Group		
Decoursey, W.J.	Chemical	Chemical Engineering Imperial College of Science and Technology (2 years)

Name	*Branch of Engineering*	*Courses of Study in U.K.*
Jull, G.W.	Engineering Physics	Electronics Imperial College of Science and Technology (2 years)
1952 Group		
Bach, G.G.	Engineering Physics	Nuclear Physics University of Birmingham (2 years)
Erb, R.B.	Civil	Aeronautical Engineering College of Aeronautics, Cranfield (2 years)
Feir, J.E.	Civil	Hydro-power and River Flow Imperial College of Science and Technology (2 years)
Murray, D.W.	Civil	Hydromechanics Imperial College of Science and Technology (2 years)
1953 Group		
Allen, L.D.	Civil	Aerodynamics College of Aeronautics, Cranfield (2 years)
Swift, G.W.	Electrical	Electrical Engineering Metropolitan-Vickers Electrical Co. Ltd. (2 years)
1954 Group		
Dawson, D.G.	Electrical	Power Side of Electrical Engineering British Thomson-Houston Co. Ltd. Rugby and Willesden (2 years)
Klingbeil, W.W.	Civil	Theory and Design of Aircraft Structures College of Aeronautics, Cranfield (2 years)

1955 Group		
Marsden, D.J.	Engineering Physics	Aeronautical Engineering College of Aeronautics, Cranfield (2 years)
1956 Group		
Howard, S.G.	Electrical	Electrical Engineering English Electric Co. Ltd. (2 years)
Parkinson, F.E.	Civil	Hydraulics D.S.I.R. Hydraulics Research Station (1 year) Imperial College of Science and Technology (1 year)
Shook, C.A.	Chemical	Chemical Engineering Imperial College of Science and Technology (2 years)
Simmonds, S.H.	Civil	Research in Concrete Technology University of Cambridge (5 months)
1957 Group		
Atkins, W.R.	Electrical	Light Electrical Engineering Imperial College of Science and Technology (2 years)
Mutter, R.J.	Mining	Environmental Engineering University of Strathclyde, Glasgow (1 year) The Scottish Council (1 year)
Platt, W.A. (First degree at Saskatchewan)	Chemical	Chemical Engineering Imperial College of Science and Technology (2 years)
Waterfield, J.W.	Electrical	Light Electrical Engineering University of Manchester (2 years)

Name	*Branch of Engineering*	*Courses of Study in U.K.*
1958 Group		
Markle, D.A.	Engineering Physics	Nuclear Power University of Birmingham (1 year) Business Administration London School of Economics (1 year)
Pawluk, W.S.	Chemical	Petroleum Technology Shell Refining Co. Ltd. (1 year) Chemical Engineering University of Birmingham (1 year)
Sovka, J.A.	Chemical	Reactor Physics University of Birmingham (1 year) Atomic Power Construction Ltd. (1 year)
1959 Group		
Cooper, G.A.	Civil	Railway Engineering British Transport Commission (1 year) Operational Research University of Birmingham (1 year)
Seguin, H.J.J.	Electrical	Electronics Imperial College of Science and Technology (2 years)
Sowa, V.A.	Civil	Soil Mechanics Imperial College of Science and Technology (2 years)
1960 Group		
Frindt, R.F.	Engineering Physics	Physics and Chemistry of Solids University of Cambridge (2 years)
Lindberg, G.M.	Engineering Physics	Applied Mechanics University of Cambridge (2 years)

1961 Group		
Kranias, J.W.	Engineering Physics	Automatic Control Systems Imperial College of Science and Technology (2 years)
Portfors, E.A.	Civil	Fluid Mechanics Imperial College of Science and Technology (1 year) University of Aberdeen (1 year)
Savage, R.H.	Civil	Structures University of Aberdeen (1 year) Control Engineering University of Strathclyde (1 year)
1962 Group		
Davis, D.N.	Electrical	Electronics and Automatic Controls Imperial College of Science and Technology (2 years)
Hemmings, R.L.	Chemical	Chemical Engineering Imperial College of Science and Technology (2 years)
Johnston, R.H.	Electrical	Electrical Engineering Imperial College of Science and Technology (2 years)
Webster, W.G.	Electrical	Electrical Engineering University of Aberdeen (17 months) General Electric Co. Ltd. (7 months)
1963 Group		
Harrison, W.C.	Engineering Physics	Nuclear Engineering University of Manchester (2 years)
Wright, J.D.	Chemical	Chemical Engineering - Controls University of Cambridge (2 years)

Name	*Branch of Engineering*	*Courses of Study in U.K.*
1964 Group		
Frederking, R.M.W.	Mechanical	Applied Mechanics Imperial College of Science and Technology (2 years)
Muilwyk, C.A.	Electrical	V.H.F. and Microwave Applications University of Sheffield (2 years)
1965 Group		
Roberts, J.D.	Civil	Structural Engineering Imperial College of Science and Technology (1 year)
Stinchcombe, H.S.	Mechanical	Thermal Power and Process Engineering Imperial College of Science and Technology (1 year)
1966 Group		
Blair, J.T.	Electrical	Power Industry Associated Electrical Industries Ltd. (2 years)
Caston, A.T.	Chemical	Automatic Control Systems Imperial College of Science and Technology (1 year) Industrial Engineering The City University (1 year)
Szentesi, O.I.	Electrical	Microwave Engineering University College, London (2 years)
1967 Group		
Coote, R.I.	Metallurgy	Superconductivity University of Cambridge (2 years)

Gourlay, W.J.	Chemical	Advanced Chemical Engineering Imperial College of Science and Technology (1 year)
McAlpine, D.C.	Chemical	Advanced Chemical Engineering Imperial College of Science and Technology (1 year) Esso Petroleum Co. Ltd. (1 year)
McRoberts, E.C.	Civil	Soil Mechanics Imperial College of Science and Technology (1 year)
Whittaker, J.D.	Civil	Structures Ove Arup and Partners (6 months)
1968 Group		
Smith, R.R.	Mechanical	Energy Conversion Queen Mary College (2 years)
1969 Group		
Chernuka, M.W.	Mechanical	Applied Dynamics University of Leicester (2 years)
Lofts, N.R.	Electrical	Control Systems Imperial College (1 year) Operational Research University of Birmingham (1 year)
Thomson, J.E.	Electrical	Science of Materials Imperial College (1 year) Engineering Research Oxford University (1 year)
1970 Group		
Chambers, D.W.	Civil	Concrete Structures Imperial College (1 year)

Name	*Branch of Engineering*	*Courses of Study in U.K.*
Constant, B.D.	Civil	Soil Mechanics Imperial College (1 year)
Hrudey, S.E.	Mechanical	Public Health Engineering Imperial College (1 year)

Appendix VI
Henry Birks Medal

The first Henry Birks Gold Medal was awarded in 1944 to Donald Quon who graduated from the Faculty in Chemical Engineering. From that time the Birks Medal has been awarded to the engineering graduate achieving the highest standing. Mr. D.A. Kirkland was the manager of the Birks store located at Jasper and 104th Street and it is speculated that Mr. Kirkland, who was well-known in Edmonton during his years with Birks from 1927 to 1945, was one of those responsible for the Birks Medal being awarded to a graduate at the University. The Birks firm determined their business was chiefly flatware, holloware and silverplate. The family business in cutlery was closely related to metallurgical engineering, so recipients of the Birks medal would be selected from the Faculty of Engineering.

The Birks family have been cutlers for generations. Richard Birks, who was born in Wombell, Yorkshire, was a cutler, a freeman and a member of the court. "One of twelfe menne of the saide scyence craft or mysterye of cutlers." Birks has the oldest registered hallmark in Britain. The Church-Warden Pipe trademark was registered in 1694. The Birks family, cutlers in fine silver, have been using the trademark since 1679.

Five generations later Richard's descendent, John Birks, who was born in Wombell in 1802, immigrated to Canada. John and his wife Ann Massey Birks arrived in Montreal in July 1832. Montreal was then a bustling city of 35,000 made rich by the fur trade. Their son Henry founded the family firm and Henry's son, William Massey Birks expanded their stores to western Canada: Calgary in 1920 and Edmonton in 1927. The growth of their family-owned business parallels Canada's growth in manufacturing and retailing. Birks is a household name in our country, synonymous with merchandise of fine quality. Fifteen of our Birks medal winners are professors of engineering across Canada and the United States.

The Henry Birks and Sons Gold Medal

1944 Don Quon — *Professor, U of A Chemical*
1945 Anatol Roshko
1946 George William Charles Mathers
1947 William Douglas Baines
1948 Israel Arnold Leak
1949 John Ruptash
1950 Douglas Alexander de Wolff
1951 James Stewart Kennedy — *Professor, U of A Mechanical*
1952 Glen Gordon Bach

1953	Richard Francis Clark
1954	William Alfred Towers
1955	Donald Edgar Wright
1956	Ronald Anderson Steven Brown
1957	George Wesley Poling
1958	Gustav Strom Christensen — *Professor, U of A Electrical*
1959	Edward Richard Peterson
1960	Fredrich William Eric Vermeulen — *Professor, U of A Electrical*
1961	Alan John Rolfe
1962	Robert Francis Manuel
1963	Craig Evan Harrold
1964	Robert Ridgeway Gilpin — *Professor, U of A Mechanical*
	Cornelis Adrian Muilwyk
1965	David Arthur Wright
1966	Terry Michael Hrudey — *Professor, U of A Civil*
1967	Gerald E. Smith
1968	Johan William Frederik Hendrik Klein
1969	David Bruce Craig
1970	Steven Eugene Hrudey — *Professor, U of A Civil*
1971	Guaning Su
1972	Kenneth James Constable
1973	Bryon Lynn Kasper
1974	Tsun—Yan Hsieh
1975	Sin Leng Low
1976	Michael Douglas Heule
1977	Charles William Labatiuk
	Ralph Witten
1978	Brice William Stephenson
1979	Louis Charles Mallet—Paret
1980	Frederic Don Choil
	Howard Douglas Plewes
	Raymond Alexander Tomcej
1981	John Douglas Hunt — *Professor, U of A Civil* (resigned, 1988)
1982	Roland Edward Heersink
	Stephen Yiu Ken Tam
1983	Mark Richard Loewen
	Warren Hugh Finlay
1984	Gary Dwayne Mandrusiak
1985	Khoo Heng Aik
1986	Christina Melanie Boyko
1987	Andrew Mark Prystajecky

Appendix VII
Edmonton Churchill Scholarship

The Right Honourable Sir Winston Spencer Churchill Society was founded in Edmonton in 1964 to perpetuate the memory of Britain's wartime Prime Minister. Each year, the society sponsors the Churchill Debates in the Edmonton high schools. The highlight of the year, for its members, is the "Churchill" banquet. The speaker at the banquet has an intimate knowledge of Sir Winston; and is asked to recall some aspect of his life and times.

The Churchill Scholarship fund was established in 1976, by Dr. Harvey D. Hebb, a prominent Edmonton physician, when he was President of The Right Honourable Sir Winston Spencer Churchill Society in Edmonton. While visiting England in July, 1975, Dr. Hebb met with Sir John Colville, who had been the Churchill speaker in the spring of that year. Sir John, one of the founders of Churchill College in Cambridge, England, arranged a visit for Dr. Hebb at the College. He met Sir William R. Hawthorne, the Master of Churchill College and others of its senior officers. They suggested the establishment of a foundation for graduate students of the University to attend Churchill College for advanced study, preferably in the field of energy. Dr. Hebb, on his return to Edmonton, sought support for the idea.

Fund raising was successful. A considerable amount of money was donated by industry; Dr. G.R.A. Rice made a very generous donation to the scholarship fund. As of January, 1987, the bulk of the fund has been re-donated to the University to set up an endowed fund for the Churchill Scholarship within the University. The double-matching grant from the Provincial Government will provide an annual scholarship. Prior to 1987, the scholarship was granted every third year.

The scholarship was started at $5,500 per year in 1978 and has continued to grow to its present $15,000 per year. The four scholarship recipients are:

1978-1980	M.D. Checkel *B.Sc. Met.E. 1976 Ph.D. 1981*
1981-1983	J.D. Hunt *B.Sc. Civ.E. 1981*
1984-1986	T.M. Maccagno *B.Sc. Met.E. 1984*
1987-	L.W. Kostiuk *M.Sc. Mec.E. 1986*

Dave Checkel is an Associate Professor in the Department of Mechanical Engineering. Doug Hunt was an Assistant Professor in the Department of Civil Engineering; he resigned his position in July, 1988. Terry Maccagno is with the National Research Council in the National Aeronautical Establishment (structures lab.) in Ottawa.

Appendix VIII

The John Alexander McDougall Gold Medal

In 1879, a young man and his bride arrived in Edmonton to begin a trading venture. The city grew; the province grew, and that young man prospered, he became one of Edmonton's leading business men. He was drafted as mayor of the city 30 years after his arrival. His fellow citizens believed his abilities were needed to control finances, remedy the problems involved in the proposed telephone system, and establish a viable system for public transportation. The mayor lived up to his reputation as a man of action. Soon, street cars were rolling, the first automatic telephone dialing system in North America was introduced and the finances of the city were in order. He was elected to the Legislative Assembly as a Liberal, a Rutherford candidate in 1909. That dynamic leader John Alexander McDougall was elected to serve as a member of the first senate of the University of Alberta.

When the first class in Applied Science graduated in 1913, McDougall willingly offered the John Alexander McDougall Gold Medal for general proficiency. The medal was awarded to W.M. Fife. The last medal was awarded in 1923, to W.G. Jewitt. Presently, the John Alexander McDougall Memorial Scholarship is offered annually to a student of outstanding merit entering the fourth year of Civil Engineering.

It is interesting to note that J.A. McDougall's grandson, John F. McDougall, graduated in Civil Engineering in 1930 and acted as Registrar of the Association of Professional Engineers for many years. A great-grandson, John Roland McDougall, graduated in Civil Engineering in 1967. He is a very active member of the Association of Professional Engineers. He has served on Council and served as President in 1980, and is on the Executive of the Canadian Council of Professional Engineers.

Statue of Edmonton Trader John A. McDougall, member of first University Senate. Established McDougall gold medals in Engineering, 1913-1923.

The John Alexander McDougall Gold Medal for General Proficiency in Applied Science

1913	Walter Maxwell Fife
1914	not awarded
1915	Leslie Stewart MacDonald
	William Sutherland McDonald (medal prizes)
1916	Leo B. Brown
1917	not awarded
1918	not awarded
1919	not awarded
1920	not awarded

1921 Harry Randall Webb
1922 Richard Burns Bryden
1923 William Gladstone Jewitt

Appendix IX

While a growing number of engineering graduates from the University of Alberta have responded to the needs of society in the development of energy resources, few have attained the eminence of Sidney Martin Blair. Blair received his Master of Science degree in mining engineering at the University in 1924. He maintained a close association with his former colleagues throughout his career.

Sidney Martin Blair, B.Sc., M.Sc., D.Eng., LLD, P.Eng.
Sidney Martin Blair was born in Parry Sound, Ontario. The family moved to Alberta where Blair attended Strathcona Collegiate Institute in Edmonton. Blair received a B.Sc. in Petroleum Engineering from the University of Birmingham, England; he returned to Edmonton to continue graduate work at the University of Alberta. His master's thesis was on the development of the Athabasca tar sands. During this period Blair worked at the Research Council with Dr. Karl A. Clark. Together they mapped the deposit's formation, sampled the whole area, analyzed the varying qualities of hydrocarbons and mineral matter and prepared a market analysis of the tar sands potential. He was co-author with Dr. K.A. Clark of the Scientific and Industrial Research Council of Alberta Report No. 18 on "The Bituminous Sands of Alberta" published in 1927.

In 1926 Blair began an employment of nearly 20 years with Trinidad Leaseholds Ltd. Blair was based for the first few years in Trinidad and thereafter in London, England. His work with Trinidad Leaseholds included project responsibility for the company's principal refinery at Point à Pierre in Trinidad. The refining of lighter oils, particularly the initial production of pure isooctane, commenced just prior to World War II. In London Blair became Engineer and Director of Manufacturing, Research, Shipping and Purchases.

At the outbreak of World War II the British Ministry of Aircraft Production asked Blair to assist in the production of aviation fuel in the United Kingdom and Trinidad. Shortly thereafter, he was given overall responsibility for the production of aviation fuel for the British government.

After the war Blair returned to business in Canada as an oil industry consultant and in 1949 when Canadian Bechtel Limited was established became its senior resident officer. Within this organization his prime concern was to establish and develop a cadre of Canadian technical excellence in engineering construction and engineering management for the building of resource and industrial projects in this country and abroad.

His highly detailed report for the Alberta Government in 1950 on "The

Development of the Alberta Bituminous Sands" covered not only the raw material in place but also the economic and technical aspects of producing finished marketable oils from this immense resource. The "Blair Report" is referred to as the definitive work on the subject. It sparked the oil industry's first major interest in the value of the Athabasca sands as a potential resource, an initiative that led directly to developments there today. Blair was Technical Director and the catalyzing force of the Oil Sands Conference organized by the government of Alberta in 1951 to study development of the Athabasca sands. He presented a paper on the larger subject of "Canada's Oil Industry" to the Royal Society of Arts, London, England, in 1952.

S.M. Blair

In his association with Canadian Bechtel Limited and its associated companies, S.M. Blair made a major contribution to many of Canada's most important industrial developments including oil refineries, chemical facilities, oil and natural gas pipeline systems and hydro-electric power projects of a magnitude unsurpassed in the Western Hemisphere. Initially in 1949, Blair served as vice president and administrative manager; subsequently he became president, vice-chairman and chairman of the board of directors of Bechtel in Canada. He was a director of Bechtel Corporation, San Francisco. He retired in January, 1974.

The work of Canadian Bechtel Limited under the administrative direction of Blair includes the first major oil and natural gas pipelines: Trans Mountain Oil Pipeline, Westcoast Transmission Natural Gas Pipeline, Trans-Canada Pipeline and the Alberta Gas Trunk Line system, the Great Canadian Oil Sands development, Churchill Falls and James Bay hydro power developments, various mines and iron ore beneficiation plants, and construction of the Medical Sciences Building at the University of Toronto.

The Churchill Falls power facility was the outstanding undertaking of his illustrious career. As chairman of the joint venture policy board Blair was responsible for the engineering and construction planning and execution of the development. In 1974 Blair presented the convocation address to the first graduating class of engineers at Memorial University, St. John's, Newfoundland. The degree of Doctor of Engineering was conferred on him at that time in recognition of his work. The following year the University of Alberta honoured his achievements by conferring an Honorary Degree of Doctor of Laws in May, 1975.

In addition to his various positions with the Bechtel organization, Blair was a Director of Alberta & Southern Gas Company Ltd. (formerly Vice-Chairman), Alberta Natural Gas Company (formerly Vice-Chairman), Canada Permanent Trust Company, Canada Permanent Mortgage Corporation, Norwich Union Life Insurance Society, Norwich Union Fire Insurance Society and Canada Assurance Security Company.

He has served his profession as a licensed engineer in Ontario, Newfoundland, Alberta, British Columbia and Quebec. He has been a member of the Chemical Institute of Canada, the Institute of Mechanical Engineers, London, England, the American Institute of Chemical Engineers, the American Society of Mechanical Engineers and the American Petroleum Institute. Blair was a charter member of the Canadian Nuclear Association and served it as president.

Coincident with his business interests, Blair bred pedigreed Suffolk sheep and Hereford cattle. It started as a hobby but soon his Cedar Mains cattle and Blairstone sheep achieved importance in the agricultural community. Sales of his animals were made to Barbados, Cuba, France, Italy, Japan, Mexico, Spain, and the United States.

Sidney Martin Blair married Nettie Russell Gentleman whom he had met while she was working in the library at the University of Alberta. He is the father of Sidney Robert Blair of Calgary and Mona Blair (Mrs. R.A. Bandeen) of Montreal.